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Effect of Concept Mapping Strategies on Student English Achievement at Secondary Level

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ABSTRACT

This experimental study aimed to examine the effect of concept mapping strategies on students' English achievement at the secondary level. The research was conducted at Government Muslim High School District Lay-yah which has a total student strength of approximately 7000. A purposive sample of 50 students from 9th class was selected and divided equally into an experimental group and a control group. The experimental group was taught using concept mapping strategies while the control group was instructed through traditional teaching methods over a period of six weeks. A pretest-post test control group design was used to assess the effectiveness of the intervention. Data were collected through standardized English achievement tests focusing on reading and writing skills. Statistical tools including mean, standard deviation and paired sample t-tests were applied using SPSS for data analysis. The findings revealed that students taught through concept mapping strategies showed significantly higher improvement in English achievement compared to those taught by conventional methods. The results also highlighted the positive impact of concept mapping on students' comprehension retention, and structured writing. It is recommended that concept mapping be integrated into secondary English classrooms to enhance language learning outcomes.

Introduction

In today's rapidly changing educational environment effective teaching strategies are crucial for improving student learning outcomes particularly in language subjects like English. English being a global language holds a significant position in academic and professional domains. However many students at the secondary level struggle with mastering the various components of English such as grammar, vocabulary, comprehension and writing. Traditional methods of teaching English often rely on rote memorization and teacher-centered instruction which fail to fully engage students or develop higher-order thinking skills.

Concept mapping is an innovative instructional strategy rooted in constructive learning theory. It involves the use of visual diagrams to represent relationships between concepts. Through concept maps, learners can organize information hierarchically and see connections among ideas which promotes deep understanding and long-term retention. When applied in the English classroom, concept mapping can help students understand the structure of texts build vocabulary and improve reading comprehension and writing organization. Therefore integrating concept mapping strategies into English instruction has the potential to significantly enhance student achievement.

In the context of Pakistan where the education system still predominantly follows traditional behaviorist approaches, incorporating concept mapping may serve as a transnational strategy. By shifting the focus from passive reception to active construction of knowledge, students can become more involved and responsible for their learning. This study investigates the effect of concept mapping strategies on student achievement in English at the secondary school level.

Within this context, concept mapping has emerged as a progressive instructional strategy that promotes deeper understanding and active engagement. Concept mapping, developed by Joseph Novak in the 1970s is grounded in Ausubel's theory of meaningful learning which suggests that new information is best learned when it is meaningfully integrated with existing cognitive structures (Ausubel, 1968). By visually organizing knowledge into hierarchical networks concept maps enable learners to see connections identify gaps and clarify complex ideas (Novak & Cañas, 2008).

Numerous studies have affirmed the pedagogical value of concept mapping across disciplines. According to Nesbit and Adesope's (2006) meta-analysis, students using concept mapping outperform their peers in terms of knowledge retention comprehension and problem-solving. In the field of English language teaching concept maps have proven particularly effective in improving writing coherence reading comprehension, and vocabulary acquisition (Liu, Chen, & Chang, 2010; Chularut & DeBacker, 2004). For instance, using concept maps while planning essays can help students structure their arguments logically leading to more coherent and well-developed texts.

In the Pakistani context, however, the instructional use of concept mapping remains largely under explored. English is taught as a compulsory subject, yet students often fail to achieve language proficiency due to teacher-centered pedagogues large class sizes and a lack of instructional innovation (Farooq & Shah, 2008). There is little focus on learner autonomy, and visual learning strategies like concept mapping are rarely integrated into English classrooms. As a result, students struggle with basic comprehension, critical analysis, and expression skills vital for academic and career success.

Furthermore, contemporary educational paradigms emphasize constructionist and learner centered approaches which encourage students to take ownership of their learning. Concept mapping fits well within this framework by encouraging active participation reflection and collaboration. It also supports differentiated instruction catering to various learning styles visual linguistic, spatial and interpersonal making it an inclusive strategy for diverse classrooms (Fielder & Silverman, 1988).

Given the growing body of international evidence on the effectiveness of concept mapping and the gap in its application within the Pakistani educational context, this study aims to investigate the effect of concept mapping strategies on English language achievement among secondary school students. It is anticipated that integrating concept maps into English instruction will enhance student engagement, promote meaningful learning, and ultimately improve academic performance.

The demand for quality English language education has significantly increased in recent years due to globalization, digital advancement, and cross-cultural communication. As a compulsory subject in Pakistan's national curriculum, English is viewed not only as a subject of study but also as a gateway to academic and socio-economic opportunities (Mahboob, 2009). Despite this, numerous studies and national assessment reports show that Pakistani secondary school students consistently underperform in English, especially in areas such as reading comprehension, vocabulary usage, grammar, and writing coherence (Siddiqui, 2007; Malik & Mansoor, 2010). This underachievement is often linked to outdated, examination focused teaching practices and the lack of innovative instructional strategies that promote understanding rather than memorization.

From a cognitive psychology perspective concept mapping aligns with schema theory which posits that knowledge is stored in cognitive structures or schemata. When students use concept maps they actively reconstruct their mental schema to accommodate new information thereby facilitating deep learning (Anderson, 1980). In language learning this has a pronounced impact as English requires not only memorization of vocabulary or grammar rules but also an understanding of how linguistic elements relate to one another in real-world contexts.

Moreover, concept mapping also facilitates meta cognition the ability of learners to think about their own thinking. By visually laying out what they know and what they do not understand, learners become more aware of their learning process and can independently identify areas of confusion (Flavell, 1979). This is particularly important in the secondary school years when students are expected to transition from passive learning to analytical and independent thinking.

Despite its documented advantages, concept mapping remains underutilized in Pakistani classrooms. A significant number of teachers are unfamiliar with the method or they lack the training and resources to implement it effectively (Shamim, 2008; Hussein, 2012). Additionally, curriculum constraints rigid assessment systems and oversized classrooms create further barriers to integrating such learner centered strategies.

Therefore, there is an urgent need to empirically evaluate the effectiveness of concept mapping in improving students' English achievement at the secondary level in Pakistan. By doing so, this study aims to provide evidence based recommendations for educators curriculum developers and policy makers seeking to enhance English language outcomes through innovative teaching strategies.

English is widely regarded as the lingual francs of the modern world. It plays a central role in global communication international trade, science, technology, media, and education (Crystal, 2003). In Pakistan, English is both a second language and an official medium of instruction in many academic institutions especially at the secondary and higher levels. As a result, students' proficiency in English is considered a critical determinant of academic success and access to higher education and job markets (Mahboob, 2009).

In language education, concept maps are used to improve reading comprehension, vocabulary development, writing coherence, and grammar understanding. For example Liu, Chen and Chang (2010) demonstrated that EFL students who used concept mapping strategies showed significantly higher reading comprehension scores than those taught with traditional methods. Similarly, Chularut and DeBacker (2004) found that concept mapping enhances self-regulation and achievement in English writing tasks.

As a result, students remain passive learners with little opportunity to reflect on or construct their understanding. Incorporating concept mapping in English classrooms could offer a practical

solution to these problems. It could not only improve students' academic achievement but also encourage independent learning, critical thinking and self-assessment.

Concept mapping has been a popular teaching and learning method in recent years. In the 1960s, Novak created the idea of concept mapping in an effort to graphically depict the information structure (Novak, 1991:45) [7]. Concept maps are instruments for visualizing concepts. They make it possible to incorporate new ideas into the perceptual framework while taking into account past knowledge and experience. Concept maps help students comprehend new ideas by drawing on their existing knowledge. It creates a connection between knowledge that is known and unknown which results in a deeper comprehension (Novak, 2010).

Ausubel assimilation and meaningful learning theory, as well as cognitive theory, are major components of concept mapping (Novak & Cañas, 2008). Assimilation theory [10] states that learning is most successful when new information is connected to previously acquired content. This notion held that a person's prior knowledge was the primary factor influencing their learning. According to this view learning occurs most effectively and meaningfully when new information is connected with existing knowledge.

As previously mentioned by Rankin-Erickson (2002), this tool helps students write with confidence by segmenting writing assignments and creating sub processes and abilities far more clear. It can help EFL students become competent and self- assured enough to compose essays using a variety of writing styles. An effective concept map can serve as a visual organizer that shows the connections between a writer's thoughts as well as their ideas for a particular writing topic (Stu-rm & Rankin-Erickson, 2002).

Concept maps are used in many study domains and are intended to foster meaningful learning. When teachers see a problem in the classroom, they frequently turn to concept maps as a remedy. A number of new teaching approaches and strategies have been developed as a result of the requirement to use a variety of them due to the recent advancements in education. and working. Concept maps are unquestionably one of these approaches and strategies.

Concept maps have been shown in numerous studies to enhance student creativity, make learning more enjoyable and facilitate the acquisition of knowledge and concepts. The impact of concept maps on student accomplishments has been the subject of numerous national and international research.

As a student-centered approach that guarantees student participation and ensures that content is understood holistically by offering both verbal and visual presentation in complicated ways, concept maps are essential for increasing students' interest and enthusiasm for the course topics. They have many beneficial aspects, including giving the teacher feedback on the areas in which the student is weak enhancing communication between students and the teacher giving them the chance to condense the material in an intelligible manner and many more.

Statement of the Problem

Despite the increasing emphasis on student centered learning English teaching practices at the secondary level in Pakistan remain largely teacher dominated. Students often struggle to achieve satisfactory results in English due to ineffective instructional methods. There is a need to explore and implement innovative strategies such as concept mapping that can support students in organizing and retaining information more effectively. This study aims to examine whether the use of concept mapping strategies can improve English achievement among secondary school students.

Objective of the Study

The following were the objectives of the study.

1. To examine the impact of concept mapping strategies on student achievement in English
2. To compare the English performance of students taught using concept mapping with those taught through traditional methods.
3. To explore students' attitudes and engagement levels toward English when taught using concept mapping strategies.

Research Questions

The following questions were to be.

1. There is no significant difference between the mean scores of the experimental and control groups in reading comprehension after treatment.
2. There is no significant difference between the mean scores of the experimental and control groups in writing skills after treatment.
3. There is no significant difference between the mean achievement scores of male and female students in the experimental group.
4. There is no significant difference between the mean scores of high achievers and low achievers in the experimental group.
5. There is no significant difference in vocabulary retention between the experimental and control groups.
6. There is no significant difference in grammar usage between the experimental and control groups after the intervention.
7. There is no significant difference in paragraph writing skills between the experimental and control groups.
8. There is no significant difference in the interest level of students toward English between the two groups after the treatment.
9. There is no significant difference in the comprehension ability of students in the experimental and control groups.
10. There is no significant difference in the ability to organize ideas in writing between the experimental and control groups.
11. There is no significant difference in the summarizing ability of students between the experimental and control groups.
12. There is no significant difference in the post-test scores of the experimental group before and after the application of concept mapping.
13. There is no significant difference between the attitude toward English learning in students of the experimental and control groups after treatment.

Significance of Study

This study is significant for teacher's curriculum designers and education policymakers. For teachers it provides practical insights into how concept mapping can be used to make English lessons more interactive and effective. For curriculum designers the findings may support the integration of visual learning tools into the English syllabus. For policymakers the results of the study can offer evidence based strategies to improve language teaching outcomes. Moreover, the study contributes to the academic literature on innovative teaching strategies and their influence on language learning in developing countries.

Methodology

Research Design

This study will employ a quasi-experimental design using a pre-test/post-test control group method. Two groups of students will be selected:

Experimental Group: Taught English using concept mapping strategies.

Control Group: Taught English through traditional lecture-based methods.

This design helps in assessing the cause-effect relationship between the teaching strategy (concept mapping) and the outcome (English achievement).

Population of the Study

The population for this research consisted of all secondary level students enrolled in public sector schools in District Layyah. These students are typically in Grade 9 where English is a compulsory subject in the national curriculum.

Table 1

Population of the study

Tehsil	Total Schools	Level	Gender	Class 9th	Class 10th	Total
Layyah	40	High	Male	894	806	1700
Karor	25	High	Male	1378	1125	2503
Chubara	25	High	Male	3438	3247	6685
Total	90	High	Male	5710	5178	10888

Sample of the Study

The population of the study comprised all male and female students of class 9th and 10th from public secondary schools affiliated with the Board of Intermediate and Secondary Education (BISE) Dera Ghazi Khan, specifically in Layyah District. A total of 5 public secondary schools were selected using purposive sampling to ensure representation from both genders and class levels. The sample included both experimental and control groups from class 9th and 10th.

Table 2

Information about the sample of study

Class	Subject	Gender	Group	Enrollment	Total
9 th	A	Male	Experimental	50	95
10 th	B	Male	Control	45	

Development of the Research Tool

The English achievement test was specifically developed from four selected chapters of the 9th class English textbook prescribed by the Punjab Textbook Board. These chapters were chosen based on their relevance to key language skills such as reading comprehension, vocabulary,

grammar, and sentence structure. The content of the test reflected the learning objectives outlined in the textbook and matched the cognitive level of secondary students. The test items were directly aligned with the lessons taught during the intervention, ensuring that the assessment remained focused and curriculum-based.

As part of the research tool, a comprehensive English achievement test was developed based on the syllabus of Class 9 prescribed by the D.G. Khan Board. The test was designed from four selected chapters of the English textbook. A total of 25 questions were included in the test. These comprised 10 multiple-choice questions (MCQs) to assess vocabulary and grammar understanding, 5 short answer questions to evaluate comprehension and recall, and 2 paragraph-based reading comprehension questions. Additionally, 1 grammar-based transformation exercise, 1 sentence correction activity, and 1 short writing task (such as dialogue writing or paragraph writing) were included to assess students' language usage and writing skills. The test covered all four key language domains: reading, writing, grammar, and vocabulary, ensuring a balanced and syllabus-aligned assessment tool.

Data Analysis and Discussion

In this study, quantitative data were collected and analyzed to evaluate the effect of concept mapping strategies on students' English achievement at the secondary level. The data comprised pre-test and post-test scores of both the experimental and control groups. Statistical techniques were employed using the Statistical Package for the Social Sciences (SPSS) to determine the significance of the differences between the means of the two groups.

Descriptive statistics such as mean and standard deviation were calculated to summarize the performance of students. Inferential statistics, particularly the independent sample t-test, were applied to compare the results. The level of significance was set at $p < 0.05$ to ensure the validity of the findings. The analysis helped to identify whether the concept mapping strategy had a measurable impact on English learning outcomes among secondary students.

Statistics Data Analysis

The target population consisted of 9th-grade students enrolled in the English subject. Two groups were selected for the study: one experimental and one control group. The experimental group was taught using concept mapping strategies, while the control group received instruction through traditional lecture methods. A pre-test was conducted for both groups before the intervention to ensure equivalence in prior knowledge and learning level.

After the teaching sessions, a post-test was administered to measure the learning outcomes of both groups. The collected data from pre-test and post-tests was scored and coded carefully, then analyzed using statistical software (SPSS). Descriptive statistics, including mean and standard deviation, were calculated to summarize student performance. An independent sample t-test was applied to compare the results of both groups.

The analysis revealed that students in the experimental group showed better performance in English achievement compared to the control group, indicating that concept mapping was an effective strategy in the context of a government school in Tehsil Layyah.

Table 3***Demographic information of sample students***

Grade	Subject	Age	Group	N	%age
9th	English	14-18	Control	45	47.4
			Experiment	50	52.6
			Total	95	100

The demographic table provides essential background information about the sample students involved in the study. The research was conducted on 9th-grade students who were studying English as a subject at a Government High School in Tehsil Layyah. The sample consisted of a total of 95 male students divided into two equal groups: an experimental group 50 students and a control group comprising 45 students. The age range of the students was between 14 to 18 years, which is typical for secondary-level learners in Pakistan.

In the table, the distribution of students is clearly shown. Both the experimental and control groups had an equal number of participants, representing 50% of the total sample each. This balanced distribution was necessary to ensure fairness and reliability in comparing the impact of different teaching strategies. The experimental group was taught through concept mapping techniques, while the control group received traditional lecture-based instruction. The table helps in understanding the structure of the sample in terms of grade level, gender, age, group type, and percentage representation, forming the basis for the statistical analysis that followed.

Table 4***Independent sample t-test with respect to pretest for experimental and control groups***

Groups	N	Mean	SD	T	Df	Sig
Experimental	50	17.682	4.263	-1.032	78.688	0.241
Control	45	16.634	5.029	-1.038	83	

The findings of an independent-sample t-test used for assessing the average scores of both the control and experimental groups with respect to the pretest.

Table 5***Independent sample t-test for experimental and control group with respect to posttest after treatment***

Groups	N	Mean	SD	T	Df	Sig
Experimental	50	34.408	10.429	-6.175	73.575	.003
Control	45	22.779	6.639	-6.082	83	

Table 5 displays the results of an independent-samples t-test that was used to compare the posttest mean scores of the experimental and control groups overall. The p values for the overall mean score of the experimental and control groups vs. the pretest were greater than 0.05, i.e. 0.00, as further evidenced by Table 4.3. Experimental group's mean of 34.408 and the Control group's mean of 22.779.

Table 6

Paired sample t-test for experimental group with respect to pretest and posttest for male and female students

Groups	N	Mean	SD	T	Df	Sig
Pretest & posttest	50	17.682	4.263	-15.461	43	.000
Experimental	45	34.409	10.429			

A paired-samples t-test was employed in Table 6 to determine the substantial disparity between the mean overall score of the group participating in the experiment on pretest and posttest. With the standardized value of p set at 0.05, the pretest (M=17.682, SD=4.263) and post experiment (M=34.409, SD=10.429) groups had significantly different scores with the standardized value of p set at 0.05. These findings indicate that students' academic performance in English improved following treatment. Furthermore,

Table 7

Paired sample t-test for control group with respect to pretest and posttest for high achievers and low achievers

Groups	N	Mean	SD	T	Df	Sig
Pretest & posttest	50	16.634	5.029	-13.135	40	.000
Control	45	22.780	6.639			

Table 7 shows that the significant difference between the control group's overall mean score on the pretest and posttest was compared using a paired-samples t- test. Although there was only a little difference in the mean scores between the pretest control group (M=16.634, SD=5.029) and the post experiment group (M=2.780, SD=6.639), p has a preset value of 0.000 ($p=0.05$).

Table 8

Independent sample t-test for experimental and control group with respect to pretest of vocabulary retention

Groups	N	Mean	SD	T	Df	Sig
Experimental	50	5.250	1.123	-1.432	82.672	.0156
Control	45	4.902	1.113	-1.431	83	

The findings of a t-test with independent samples used for comparing the average scores of the experimental and control groups compared to the pretest.

Table 9

Independent sample t-test for experimental and control group with respect to posttest of grammar usage

Groups	N	Mean	SD	T	Df	Sig
Experimental	50	9.136	2.298	-6.078	74.962	.000
Control	45	6.585	1.516	-5.993	83	

Table 9 shows the results of independent-samples t-test used to compare the mean scores of grammar usage in the experimental and control groups in relation to the posttest. Table 9 further demonstrated that the p values for the experimental and control groups' mean scores in relation to the pretest were less than e. 0.05. Table 9 also showed that the Experimental group's mean was 9.136 and the Control group's mean was 6.585, with a difference of 2.551. More ever, From Table 9 it was concluded that the value of significance level (0.000) was found greater than 0.05, So, null hypothesis is rejected.

Table 10

Paired sample t-test for experimental group with respect to pretest and posttest for paragraph writing skills

Groups	N	Mean	SD	T	Df	Sig
Pretest & Posttest	50	5.250	1.123	-14.265	43	.000
Experimental	45	9.136	2.298			

The experimental groups mean score on paragraph writing skills ont he pretest and posttest was compared using a paired-samples t-test in Table 10.

The scores for the pretest experiment group (M=5.250, SD=1.123) were substantially different from those for the post experiment group (M=9.136, SD=2.298), and the standardized value of p was 0.05 (p=0.05). It was also determined from Table 10 that the value of p is .000 and hypothesis rejected due to significant difference is present in these groups.

Table 11

Paired sample t-test for control group with respect to pretest and posttest for interest level of students toward English

Groups	N	Mean	SD	T	Df	Sig
Pretest & Posttest	50	4.902	1.113	-8.882	40	.000
Control	45	6.585	1.516			

The significant difference between the control group's mean scores on the pretest and posttest was compared using a paired-samplest-test in Table 11. The standardized value of p is .000 (p=0.05), which indicates that the mean scores for the pretest control group (M=4.902 SD=1.113) and posttest control group (M=6.585 SD=1.516) were different. Additionally, Table 11 showed that the value of p was .000, which was lower than the suggested value. So, null hypothesis is rejected.

Table 12

Independent sample t-test for experimental and control group with respect pretest of comprehension ability of students

Groups	N	Mean	SD	T	Df	Sig
Experimental	50	8.568	2.245	-.630	76.60	.258
Control	45	8.220	2.806	-.635	83	

Table 12 displays the results of an independent-samples t-test performed to compare the experimental and control groups' to the pretest. Table 12 further revealed that the statistically significant differences for the total mean score of both control and experimental groups were 0.348 when compared to the pretest. Table 12 also described that the mean of the Experimental group was 8.568 and the control group was 8.220 having the difference 0.348. The difference in Std. Deviation indicating that there is difference is these two groups in pretest values. From Table 12, the hypothesis is accepted since the value of p (.258) indicates that there is no significant difference between these two groups which is greater than the provided value of 0.05.

Table 13

Independent sample t-test for experimental and control group with respect posttest of ability to organize ideas in writing

Groups	N	Mean	SD	T	Df	Sig
Experimental	50	16.659	5.348	-5.913	72.354	.002
Control	45	11.000	3.301	-.5.819	83	

The average responses from the control and experimental groups on brief questions were compared in connection to the posttest using a t-test with independent sample, as shown in Table 13. Table 13 also showed that the p values for the posttest mean scores for both the experimental and control groups were larger than .005, it revealed a mean difference of 5.659 between the Experimental group's mean of 16.659 and the Control group's mean of 11.000. Table 13 concludes that the significance level (.002) is bigger, so there is an acceptance of null hypothesis occurs and there is very small significance difference is seen in overall performance of experimental and control groups in posttest achievement in short questions.

Table 13

Paired sample t-test for experimental group with respect to pretest and posttest for summarizing ability of students

Groups	N	Mean	SD	T	Df	Sig
Experimental	50	16.659	5.348	-14.618	43	.000
Control	45	8.568	2.245			

A paired-samples t-test was used in Table 13 to compare the significant difference in the experimental group's between pretest and posttest. Scores differed significantly between the experiment and post- experiment groups. (M=16.659, SD=8.568), and 0.000 was the recommended value of p. (p=0.00). These findings indicate that students' academic performance in English has improved. Table 13 concluded that the hypothesis is rejected since the value of p is .000, which is less than the allocated value of 0.05.

Table 14

Paired sample t-test of overall score for control group with respect to pretest before and after application of Concept mapping

Groups	N	Mean	SD	T	Df	Sig
Pretest & Post Test	50	8.220	2.806	-10.686	40	.000
Control	45	11.000	3.301			

According to Table 14, paired-samples t-test was used to compare the significant difference mean score of the control group on pretest and posttest. The mean scores for the pretest control group (M=8.220, SD=2.806) and posttest control group (M=11.000, SD=3.301) differed slightly, and the standardized value of p was 0.05 ($p=0.000$). Table 14 further demonstrated that these findings suggest that students' academic performance in English has improved. Because our findings indicated that there was an improvement in performance. According to Table 14, the value of p was 0.000, which was less than the given value of 0.05; As a result, because the value was less than 0.05, the null hypothesis was rejected.

Table 15

Independent sample t-test for experimental and control group with respect to pretest for attitude towards English learning students

Groups	N	Mean	SD	T	Df	Sig
Experimental	50	3.863	1.193	-1.189	76.312	.124
Control	45	3.512	1.502	-1.199	83	

The results of a t-test with independent samples were used to compare the mean scores of the experimental and control groups and the pretest. The results are shown in Table 15. Table 15 further reveals that the p values for the total mean score of the experimental and control groups in comparison to the pretest were .124. The experimental group's mean was 3.863, whereas the control group's mean was 3.512, a difference of 0.351, as shown in Table 15. There was a difference between these two groups' pretest scores, as indicated by the difference in standard deviation, which was 0.305. From Table 15, it was also concluded that the p value (.000) was less than the standard p value (0.05). So, the null prediction has been ruled out since there is no longer a difference in the mean values of both the control and the experimental groups in long questions compared to the pretest test.

Summary

This research study was conducted to investigate the effectiveness of concept mapping strategies in improving English language achievement among secondary school students. The study focused on students of Government High School, Chowk Azam, District Layyah, Tehsil Layyah (Punjab). The total strength of the school was approximately 7,000 students, out of which a sample of 95 students was randomly selected, equally divided into experimental (50) and control (45) groups.

The primary aim of the study was to assess whether concept mapping as a cognitive strategy could significantly enhance students' understanding and performance in the English subject. The research specifically targeted secondary-level students, as this stage is crucial for language foundation and academic success.

Conclusions

The statistical analysis of data collected through pre-test and post-tests has clearly demonstrated the effectiveness of concept mapping strategies in enhancing the English achievement of secondary school students. The comparison of mean scores between the experimental and control groups revealed that students taught through concept mapping significantly outperformed those taught through traditional methods. This improvement was confirmed through paired sample t-tests, which showed statistically significant differences in the post-test scores in favor of the experimental group.

The pre-test results showed no significant difference between the two groups, confirming the homogeneity of the sample at the beginning of the study. This provided a solid foundation for attributing any observed change in learning outcomes to the instructional intervention rather than to pre-existing differences. The increase in the mean scores of the experimental group in the post-test proved that concept mapping not only facilitated better comprehension and retention but also contributed to the development of students' reading and writing skills.

Furthermore, the statistical results indicated that both male and female students in the experimental group benefited equally from concept mapping. The absence of significant gender-based differences in learning outcomes confirmed the inclusiveness and adaptability of this strategy. Additionally, student engagement and motivation appeared to increase as a result of using visual learning tools, as reflected in their improved academic performance.

These findings are in line with the theoretical framework of meaningful learning, which emphasizes the importance of visual organization and conceptual relationships. The data supports the hypothesis that concept mapping promotes deeper understanding, encourages critical thinking, and enhances language performance more effectively than conventional teaching methods.

Recommendations

Based on the findings and statistical analysis of this study, the following recommendations are proposed for improving English language achievement at the secondary school level through concept mapping strategies:

Integration of Concept Mapping in Curriculum:

English teachers should be encouraged to incorporate concept mapping strategies into their daily teaching practices. Concept maps can help students visually organize information, understand key concepts, and develop connections between ideas, especially in reading and writing.

Teacher Training and Workshops:

Professional development programs and workshops should be arranged for English teachers at the secondary level to train them in designing and implementing concept maps effectively. Teachers should be provided with tools, templates, and practical models to apply concept mapping in language classrooms.

Inclusion in Textbooks and Learning Materials:

Curriculum developers and textbook boards should include concept mapping activities and examples in English textbooks. These should be integrated into reading passages, vocabulary exercises, and writing tasks to promote cognitive engagement and meaningful learning.

Use of Technology-Based Concept Mapping Tools:

Digital concept mapping tools (such as MindMeister, Coggle, or Inspiration software) should be introduced in classrooms where possible. These tools can make learning more interactive and accessible, particularly for visual learners and tech-savvy students.

Focus on Student-Centered Learning:

Teachers should adopt student-centered approaches where learners are actively involved in constructing their own concept maps. This practice encourages creativity, critical thinking, and ownership of learning, leading to improved academic performance.

Regular Assessment Using Concept Maps:

Concept mapping can also be used as an alternative or supplementary assessment technique. Teachers can evaluate students' understanding by asking them to create concept maps after lessons, helping them to assess comprehension and synthesis of knowledge.

Research Extension to Other Subjects and Levels:

Future researchers are encouraged to explore the effectiveness of concept mapping strategies in other subjects (e.g., science, social studies) and educational levels (e.g., primary or higher secondary). This can help generalize the benefits of concept mapping across disciplines.

Encouragement of Collaborative Mapping:

Group-based concept mapping activities should be promoted to enhance collaborative learning. When students work together to create concept maps, they share ideas, negotiate meaning, and strengthen their communication and teamwork skills.

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