# INVESTIGATING THE IMPACT OF CONCEPT MAPPING STRATEGY ON STUDENTS ACADEMIC ACHIEVEMENT

**Sukhdeep Kaur**
Assistant Professor
University School of Education,
Rayat Bahra University, Mohali

## ABSTRACT

This paper explores the impact of concept mapping strategy on academic achievement in Punjabi language grammar within the context of secondary education in Mohali district of Punjab, India. The research methodology employed a randomized pre-test, post-test experimental design involving 100 seventh-grade students from Mohali district, Punjab. The study compared the academic achievement of students taught Punjabi grammar using concept mapping strategies versus traditional teaching methods. Results indicate a significant improvement in post-test scores for students exposed to concept mapping, highlighting its efficacy in enhancing learning outcomes. Moreover, the study found no significant gender differences in academic achievement, suggesting that concept mapping is equally beneficial for both male and female students.

## INTRODUCTION

Language is a crucial symbol of identity and status for its speakers. People are keenly aware of the language they use to maintain their social class and status. Punjabi Language, in particular, is both rich and straightforward, with a vast and diverse literary heritage. It is a core subject in school curricula, defining key human traits and encompassing many disciplines that highlight various aspects of life. Teaching Punjabi Language in schools helps develop well-informed and knowledgeable individuals. It also facilitates understanding of cultural differences and human behavior among citizens. Proficiency in Punjabi Language increases students' awareness, fostering a more responsible society. Moreover, studying Punjabi Language enhances adherence to moral and ethical values. Preparing students to be responsible members of a democratic society is a complex task, and Punjabi Language plays a significant role in this by covering a broad range of topics. It encourages students to make independent decisions, think critically, and engage with numerous challenges. The importance of Punjabi Language in the curriculum is undeniable and essential. Teaching the Punjabi Language needs to be revitalized to help students acquire knowledge and skills in an interactive way. Punjabi Language instruction should

employ techniques that foster imagination, visual awareness, and meaningful insights. It should guide students to connect the past with the present, helping them recognize the changes occurring in society. Today's education demands a shift from traditional verbalism or lecture methods to approaches that emphasize active involvement, such as collaborative learning, cooperative learning, and concept mapping. According to Ausubel (1968), "The most important single factor influencing learning is what the learner already knows; ascertain this and teach accordingly." This calls for a strategy that transforms the teacher's role from being an active speaker to a facilitator.

## CONCEPT MAPPING

The fundamentals of concept mapping are grounded in Ausubel's theory of learning, which suggests that meaningful learning occurs when novel concepts are linked to familiar ones already existing in the learner's cognitive framework (Ausubel, 1968). A concept map acts as a visual aid, highlighting the focal points that students and educators should focus on during a particular learning endeavour. It serves as a tool to depict the interconnections among concepts in any given text, regardless of the subject area. Concept maps are graphical illustrations of meaningful associations between concepts. They serve as schematic tools for illustrating a collection of concept meanings integrated within a structure of propositions (Novak & Gowin, 1984).

The technique originated with Novak at Cornell University during the 1960s. This approach surfaced within the realm of learning in response to the emerging constructivist perspective, which underscores the active engagement of learners in knowledge construction. The act of refining personal, meaningful knowledge transpires through the reorganization of preexisting concepts. As articulated by Novak (1991) meaningful learning entails the integration of novel concepts and propositions into the preexisting cognitive frameworks.

## ACADEMIC ACHIEVEMENT

Academic achievement embodies the attainment of educational objectives by students, educators, or institutions, encompassing a wide array of accomplishments within and beyond the classroom. It encompasses proficiency across various academic domains, including traditional subjects as well as extracurricular pursuits such as sports, communication abilities, punctuality, and engagement in cultural and artistic endeavors. Successful academic performance also entails overall adjustment and well-being.

Academic achievement can be defined in diverse ways. Lindquist characterized it as the capacity to complete assigned tasks and comprehend concepts both quantitatively and qualitatively. Within the educational context, achievement specifically refers to the mastery of knowledge and skills, often evaluated through assessments or examinations. Educational frameworks are often delineated in terms of inputs and outputs, with inputs including measurable student attributes and outputs typically gauged by student performance on achievement tests, serving as metrics of school effectiveness. Academic achievement is frequently appraised through standardized assessments and conveyed through grades or units aligned with benchmarks established via broad assessments of student performance. As delineated by Morgan, Sato, Matsuo, and King (1986), achievement encompasses behavior directed towards tasks, evaluated based on both internally set goals and externally defined criteria. As per Craighhead and Nermeroff (2001), academic achievement can be characterized by the exhibition of knowledge, comprehension, and proficiency in a particular subject or set of subjects. Undoubtedly, academic success is a multifaceted concept shaped by a myriad of influences. Intelligence, personality attributes, motivation, school environment, genetic predispositions, home dynamics, educational opportunities, interests, talents, familial upbringing, and parental socio-economic status are among the myriad factors that may affect scholastic performance. As highlighted by Sinha (1970), elements such as diligence, cognitive abilities, memory capacity, physical well-being, availability of educational materials like books, study techniques, financial security, and participation in social and practical endeavors can exert a substantial impact on academic achievement. It's crucial to acknowledge that the amalgamation of factors influencing academic success can vary significantly across diverse educational settings, student demographics, and cultural milieus. Each student's academic trajectory is influenced by a distinctive interplay of these variables.

## REVIEWS OF LITERATURE

### Concept Mapping and Academic Achievement

Rao (2004) explored the utilization of concept mapping as a pedagogical approach to augment meaningful learning and enhance students' proficiency in scientific process skills. Hay, Kinchin and Lygo-Baker (2008) outlined the utilization of the concept-mapping approach as a mechanism for improving instructional efficacy in higher education settings. Wheeldon and Faubert (2009) concluded that concept mapping is a graphic and participant-centric means to ground data within theory. Sharma (2010) investigated that

students taught by concept mapping method acquired and retained more concepts of environmental awareness than those students who were taught by conventional method. Alebiosu and Michael (2011) demonstrated that the utilization of concept mapping had a significant impact on students' attitudes, particularly in the context of physics education. Aggarwal (2012) described that computer-based concept mapping proved to be better instructional strategy over lecture method in acquisition of concepts of chemistry. Cheema and Mirza (2013) explored the efficacy of concept mapping as a teaching and learning strategy compared to traditional methods in enhancing the academic achievement of both male and female students in the subject of General Science. Phantharakphong and Pothitha (2014) explored the correlation between reading comprehension and concept maps, suggesting their integrated and creative application in learning management to enhance students' English reading skills. Chawla (2015) demonstrated that girls taught using Concept Mapping exhibited significantly higher achievement in Chemistry compared to those taught using conventional methods. Kalhor and Mehran (2016) indicated that the utilization of the concept mapping strategy positively influences English academic achievement and promotes meaningful reading comprehension in students. Bardel and Mahmoudi (2019) suggested that concept maps are more effective than traditional teaching methods, as they have a positive impact on the academic achievement of students. Collin and Nyenhuis (2021) suggested that employing concept maps in teaching enhances learning and retention, leading to meaningful learning and improved academic achievement. Bizimana, Mutangana and Mwesigye (2022) suggested that biology teachers should integrate concept mapping (CM) and concept mapping learning (CML) strategies into their instruction to foster a positive attitude toward biology among students. Lechuga, Ortega-Tudela and Gómez-Ariza (2024) found concept mapping prior to free recall significantly enhanced performance on a 2-week delayed learning test compared to the reverse order, despite lower success rates during practice, indicating both direct and indirect effects of retrieval sequence in mediation analysis.

## NEED AND IMPORTANCE OF THE PROPOSED STUDY

There are numerous advantages of including this concept mapping tool to a teacher's instructional approaches but in literature, the research in this field of Punjabi Language Grammar using concept mapping is found to be minimal. The teaching of Punjabi Language grammar utilization concept mapping helps to construct domain knowledge, to know the thoughts of learners about curriculum, and to make available possibilities for learners to create appropriate and significant associations within the domain knowledge.

Teachers of Punjabi Language have voiced apprehension about the decrease in academic performance of this subject's students and they consider the teaching-learning approaches used as one of the major reasons for this decline. Concept mapping approach has been demonstrated to be successful in enhancing the academic achievement in recent researches undertaken for subjects like Mathematics, Biology, Physics, Chemistry and English Language. There is also lack of experimental findings on the utilization of concept mapping as a teaching approach in enhancing students' performance and preservation capability, specifically in Punjabi Language grammar. The proposed study aims to Investigating the Impact of Concept Mapping Strategy on Student Academic Achievement.

## OBJECTIVES

The proposed objectives of the study to be carried out are:

- To study the significance of difference in Academic Achievement in Punjabi Language of the groups taught through Concept mapping strategy and Conventional teaching.
- To study the significance of difference in Academic Achievement in Punjabi Language of the groups of male and female students.

## HYPOTHESES

The hypotheses of the proposed work are:

- There will be no significant difference in Academic Achievement in Punjabi Language of the groups taught through Concept mapping strategy and Conventional teaching.
- There will be no significant difference in Academic Achievement in Punjabi Language of the groups of male and female students.

## DELIMITATIONS

The study is proposed to be delimited as per following details:

1. The sample of study has been delimited to 100 students.
2. The present study has been confined to students of $7^{th}$ class only.
3. The present study has been confined to Punjabi Language Grammar.

4. The study has been confined to the students of Mohali district of Punjab only.

## DESIGN OF THE STUDY

The experimental design has been used in the present study. Randomized pre-test, post-test design has been employed. In the 1st phase concept maps in Punjabi Grammar has been constructed and achievement test in Punjabi Grammar has been constructed. Scores of previous class has been used to equate the two groups of students; experimental group and control group.

In the 2nd phase achievement test has been applied as pre-test to both the groups. The students of experimental group have been exposed to concept mapping strategy for teaching Punjabi Language and control group has been taught Punjabi Language with traditional method.

In the 3rd phase achievement test has been again applied on both the groups as post-test.

## SAMPLE

A sample of 100 students of 7th class from High school has been taken through the multistage randomization technique from Mihali district, Punjab. The sample included boys as well as girls studying in class 7th. Efforts were made to make the sample as fairly representatives as possible.

## TOOLS USED

- Lesson Plan based on concept mapping strategy on selected topics of Punjabi Grammar for class 7th have been prepared by the investigator.
- Achievement Test in Punjabi Grammar on selected topics from class 7th has been developed by the investigator herself.

## STATISTICAL TECHNIQUES

The following statistical methods have been utilized for the present study.

1. The hypotheses of the study were examined through an analysis of the gathered data using measures such as Mean, Standard Deviation (SD), and t-test. Graphical representations were also generated to explore the overall characteristics of the data.

2. The t-test was utilized to determine the significance of the difference between means associated with distinct groups.

## ANALYSIS AND INTERPRETATION OF RESULT

Table 1 Showing Pretest Achievement Mean Scores in Punjabi Grammar of Experimental and control group of students

| Groups | N | M | SD | $SE_D$ | t- ratio | Inference |
|---|---|---|---|---|---|---|
| Experimental Group | 25 | 26 | 7.07 | 3.46 | 0.34 | Insignificant |
| Control Group | 25 | 21.8 | 6.05 | | | |

Table 1 indicates that the pretest mean scores for the experimental and control groups are 26 and 21.8, respectively. The standard deviations (S.D.) for the experimental and control groups are 7.07 and 6.05, respectively. The t-ratio is 0.34, which is deemed insignificant at both levels. This suggests that there is no significant difference in the achievement test scores between the experimental and control groups before the intervention.

Table 2 Showing Post test Achievement Mean Scores in Punjabi Grammar of experimental and control group of students

| Groups | N | M | SD | $SE_D$ | t-ratio | Inference |
|---|---|---|---|---|---|---|
| Experimental Group | 25 | 28.8 | 5.03 | 2.01 | 4.28 | significant |
| Control Group | 25 | 20.2 | 5.01 | | | |

Table 2 illustrates that the posttest mean scores for the experimental and control groups are 28.8 and 20.2, respectively. The standard deviations (S.D.) for the experimental and control groups are 5.03 and 5.01, respectively. The t-ratio is 4.28, which is significant at the 0.05 level. This indicates that there is a significant difference in the achievement test scores between the experimental and control groups after teaching using the concept mapping strategy and traditional teaching method. There is a notable disparity in the mean scores of students between the experimental and control groups in the post-test.

Table 3 Showing Pretest Achievement Mean Scores in Punjabi Grammar of experimental and control group of male and female students.

| Groups | N | M | SD | $SE_D$ | t- ratio | Inference |
|---|---|---|---|---|---|---|
| Male Students | 25 | 21.2 | 8.35 | 2.212 | 1.356 | insignificant |
| Female Students | 25 | 24.2 | 7.25 | | | |

Table 3 presents the pretest mean scores for male students and female students as 21.2 and 24.2, respectively. The standard deviations (S.D.) for the experimental and control groups are 8.35 and 7.25, respectively. The t-ratio is 1.356, which is not significant at the 0.05 level of significance. This indicates that there is no significant difference between the pretest scores of achievement tests for male and female students. The study reveals that there is no notable disparity in the mean scores between male and female student groups before intervention.

Table 4 Showing Posttest Achievement Mean Scores in Punjabi Grammar of experimental and control group of male and female students

| Groups | N | M | SD | $SE_D$ | t- ratio | Inference |
|---|---|---|---|---|---|---|
| Male Students | 25 | 28.8 | 4.4 | 1.216 | 0.656 | insignificant |
| Female Students | 25 | 29.6 | 4.2 | | | |

Table 4 displays the posttest mean scores for groups of male students and female students as 28.8 and 29.6, respectively. The standard deviations (S.D.) for the group of male students and female students are 4.4 and 4.2, respectively. The t-ratio is 0.656, which is not significant at the 0.05 level. This indicates that there is no significant difference between the posttest scores of achievement tests for male and female students after teaching through concept mapping strategy and traditional teaching methods. The study suggests that there is no notable distinction in the mean scores between male and female student groups in the posttest phase.

## RESULT AND DISCUSSION

The analysis indicated that the Concept Mapping teaching method significantly enhances achievement in Punjabi grammar compared to Conventional teaching. However, this method does not demonstrate a significant effect on gender concerning achievement in Punjabi grammar. The findings of the current study underscore the utility of Concept Mapping for teaching Punjabi grammar concepts. Additionally, the lack of significant difference in Punjabi grammar achievement between male and female students in the experimental group suggests that the strategy is equally advantageous for both genders. Consequently, Concept Mapping techniques are strongly advocated for teaching Punjabi grammar in Punjab schools.

## EDUCATIONAL IMPLICATIONS

The educational implications of these findings are significant. Firstly, they highlight the effectiveness of Concept Mapping as a teaching strategy for enhancing student achievement in Punjabi grammar. Educators can integrate Concept Mapping techniques into their lesson plans to facilitate a deeper understanding of grammar concepts among students.

Furthermore, the absence of a significant difference in Punjabi grammar achievement between male and female students suggests that Concept Mapping is inclusive and beneficial for all genders. This implies that educators can use Concept Mapping as an equitable teaching approach to cater to the diverse learning needs of students regardless of gender.

Overall, the study underscores the importance of innovative teaching strategies like Concept Mapping in promoting academic success and fostering an inclusive learning environment. Educators should consider adopting Concept Mapping techniques to enhance student engagement, comprehension, and achievement in Punjabi grammar and other subject areas.

## REFERENCES

Aggarwal, A. (2012). *Effectiveness of computer-based concept mapping in acquisition of concepts of chemistry in relation to attitude towards science*. Ph. D. Thesis in Education, Panjab University, Chandigarh.

Ahmed, M. A., Shittu, F. A., Yahaya, L., & Dada, A. O. (2021). Effects Of Concept-Mapping Instructional Strategy on Senior School Students' achievement in Biology, Lagos State, Nigeria. *Mojes: Malaysian Online Journal of Educational Sciences*, *9*(1), 14-23.

Alebiosu, K., & Michael, E. (2011). Concept mapping teaching strategy and secondary students' attitude to physics in Ibadan, Nigeria. *The African Symposium: An Online Journal of the African Educational Research Network, 11*(2), 119–127.

Asan, A. (2007). Concept mapping in science class: a case study of fifth grade students. *Educational Technology & Society*, *10*(1), 186–195.

Ausubel, D. P. (1968). A Cognitive view. *Educational Psychology*.

Bardel, M., & Mahmoodi, F. (2020). A comparative study of the effectiveness of Concept Map and Classical Method on Achievement. *The Journal of New Thoughts on Education*, *16*(1), 153-168.

Bizimana, E., Mutangana, D., & Mwesigye, A. (2022). Enhancing students' attitude towards biology using concept mapping and cooperative mastery learning instructional strategies: Implication on gender. *LUMAT: International Journal on Math, Science and Technology Education*, *10*(1), 242-266.

Chawla, J. (2015). *Effect of concept mapping strategy on achievement in chemistry of IX graders in relation to achievement motivation and study habits*. Ph. D. Thesis, Panjab University, Chandigarh.

Cheema, A. B., & Mirza, M. S. (2013). Effect of concept mapping on students' academic achievement. *Journal of Research and Reflections in Education, 7*(2), 125–132.

Collins, B., & Nyenhuis, R. (2021). The effectiveness of concept maps for students' learning and retention. *Journal of Political Science Education*, *17*(sup1), 897-909.

Craighhead, W. E., & Nermeroff, C. B. (2001). *The Corsini Encyclopaedia of Psychology and Behavioural Science.* New York: John Wiley and Sons.

DeMorais, M. A., Hirano, F. W., De Araujo, T., & De Nery, G. (2016). Use of concept maps as a strategy for teaching-learning and assessment tool in geography lessons. *CEUR Workshop Proceedings*, 139–146.

Hay, D., Kinchin, I., & Lygo-Baker, S. (2008). Making learning visible: the role of concept mapping in higher education. *Studies in Higher Education*, *33*(3), 295–311.

Kalhor, M., & Mehran, G. (2016). The effect of concept mapping on EFL students' meaningful learning of english reading comprehension. Paper presented at the Seventh International Conference on Concept Mapping, Tallinn, Estonia, 1–9.

Kochhar, R. S. (2007). *Effectiveness of computer assisted instruction and concept mapping in acquisition of biological Concepts in relation to style of learning and thinking*. Ph. D. Thesis, Panjab University, Chandigarh.

Morgan, J.W., Sato, M., Matsuo, S. & King, C., Y. (1986). Ultramafic xenoliths; clues to Earth's late accretionary history. *In: Journal of Geophysical Research, B, Solid Earth and Planets; Special section; Gas geochemistry of volcanism, earthquakes, resource exploration, Earth's interior. Sato, M., Matsuo, S. and King, C.-Y. (Editors), American Geophysical Union, Washington. 12,375-12,387.*

Novak, J. D. (1991). Clarify with concept maps: a tool for students and teachers alike. *The Science Teacher, 58*, 45–49.

Novak, J. D., & Gowin, D. B. (1984). *Learning how to learn*. cambridge University press.

Olarewaju, A., & Awofala, A. (2011). Effect of concept mapping strategy on students' achievement in junior secondary school mathematics. *International Journal of Mathematics Trends and Technology*, *2*(3), 11–16.

Phantharakphong, P., & Pothitha, S. (2014). Development of English reading comprehension by using concept maps. *Procedia - Social and Behavioral Sciences*, *116*(2014), 497 – 501.

Rao, M. P. (1998). Effect of concept-mapping in science on science achievement, cognitive skills and attitude of students. *Knowledge Representation,* 130–131.

Sharma, J. (2010). *A study on acquisition of environmental awareness through concept mapping among IX graders in relation to achievement motivation and cognition styles*. Ph.D. Thesis, Panjab University, Chandigarh.