

## **Cognitive Mind Maps as a Tool for Enhancing Academic Achievement among High School Students-Case Studies.**

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**ABSTRACT:** Cognition is an essential component of the learning experience. Teaching and Learning is a powerful interaction involving the five cognitive senses of Vision, Audition, Olfaction, Gustation and Tactition. Cognitive Mind Maps are used by corporates and in Technical colleges for presentation and planning. Some published reports claim success in using Mind Maps in elementary and secondary schools overseas- in U.K. and in Australian schools. There appears less published documentation of its use in Indian schools. A large section of the student body in high schools are unable to communicate effectively in English, though fluent in Regional languages, simultaneously attending schools where English is the medium of instruction. The exposure to English is through TV programs and English cinema which they rarely view. Dropout rates at High school level are alarming. Drastic steps to address this problem are required. The introduction of Cognitive Mind Map use in High schools may provide an upto date solution. The present experimental study examines the effect of Cognitive Mind Map usage in High Schools and its relationship to learning, thinking and Brain hemispheres with reference to case studies.

**KEY WORDS:** High School, learning, Mind Maps, Case studies.

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### **I. INTRODUCTION**

A significant problem being faced in School Education in India today is the increasing dropout rates in High school. High school children sometimes lose interest or cannot cope with the higher levels of study. There exist the constituents of poor instruction and infrastructures. Our population is vast and India is a country of numerous regional languages and dialects. As such, in some lower economic sections, the students find it difficult to understand the lessons at high school levels when English is the medium of instruction. In these environs the only exposure to English comprise TV programs or English films, which they do not watch. Sometimes efforts to memorize whole answers from poor quality guides and question banks fail miserably.

#### **Need and justification**

Drastic measures and innovative, upto date methods are required to handle this situation. There is an urgent requirement to address an expanse of problems arising from students of a large proportion of the student populace who communicate only in Regional languages and attend Schools which utilize English as the medium of Instruction. It is reported that in Andhra Pradesh and Telangana more than five thousand schools are making the shift from instruction in the regional language to English (The New Indian Express, 2017.) Cognitive Mind Maps that visually represent the gist of a subject and related facts and links in a pictorial form with 'key' words may answer the problem. They outline the lesson in a precise, easily remembered visual form with a central idea, 'Key' words, the branches and sub-branching, depicting and connecting details. 'The visual impact on the brain is perhaps the most powerful of all the cognitive senses.' (Galotti, 2012) Cognitive Mind Maps are used extensively in the corporate sector for presentation, instruction and planning. There is minimal evidence of its use in schools as a mode of teaching. (Buzan, 2006). There are present what are called Mind Maps in published texts and study material but these are more in the nature of concept maps in black and white without utilization of 'colours'. The advantages of using 'colours', minimum of four, in Mind Maps have been reviewed by examining previous research conducted in these areas (Bhoopal, 2016)

#### **History and Origins**

Indian History, Art and Visual Cognitive Representations, especially in the medieval period, were studied. Extremely high levels of skill in Mathematics, Technology and Education stand as evidence to advanced levels of knowledge in an age when there was no advantage of mass produced printed material as

tools to disperse education (Bhoopal, 2016). Tony Buzan first introduced the term “Mind Map” in the course of a popular British series on Psychology by the BBC. He holds a patent and is the author of various books on the nature of “Mind Maps” and the benefits of using them in education and presentation (Buzan, 1996).

### **Role of Colour in Mind Maps**

Previous research studies stress connections between memory, ‘colours’ and recall. Bhoopal (2016). Colours draw attention stated Farley and Grant’s study (1976). Comparisons of studies in ‘colour’ usage and its success in ‘presentations’ were explored by Greene, Boyer and Bell (1983) ‘Colour and visual memory’ improvement were studied by Sharpe, Gegenfurtner and Wichman (2002). Lloyd-Jones Hall and Vernon researched ‘colour effects’ in explicit and implicit memory (2004). Effects of ‘colour’ on permanent memory storage and increased recall were explored by Sternberg (2009). Links between memory, emotional arousal and attention were researched by Kaya and Epps (2010). Studies (2009 and 2012) by Pan examined ‘colour’ and visual attention.

Research studies by Torrance and Reynolds (1978), Torrance and Bracken (1979) and Venkatraman (1989) signify the possibility of modification in a person’s habituated style of thinking and learning during a comparatively short period of six - ten weeks. Cognitive Mind Maps may be used as an effective tool in the teaching and learning process, reducing stress for both teacher and student (Bhoopal, 2019).

### **Objectives of the Research Study**

The primary aim of the research was to explore the role played by the use of Cognitive Mind Maps in achievements in academics by High School students. The study researched the existence of a relationship between the use of Cognitive Mind Maps, brain hemispherical functioning and thinking and learning styles among High school students.

### **Hypotheses**

1. The use of cognitive Mind Maps increases academic progress and achievement in High School Students.
2. There is a relationship between usage of Cognitive Mind Maps and styles of learning and thinking.

### **Research Design**

Experimental research was conducted using the Pretest/Posttest design. Scores in tests of participants before and after the implementation of Cognitive Mind Maps were calculated and recorded.

### **Tools used in the Research**

1. Intelligence Quotient Test – “Draw a Man Test” by DR, Pramila Phatak.
2. “Test of Style of Learning and Thinking-(SOLAT) by Dr.D.Venkatraman, Administrator’s Manual.”
3. “I Mind Map Software”, Version 7 of Tony Buzan.

## **II. DESCRIPTION OF TOOLS**

### **“Draw a Man Test for Indian Children”**

The revised test VIIIth Edition, 2013 of Dr. Pramila Phatak was used.

This test employs the conception of the human body to assess intelligence. It comprises points to score, total 25 in number, based on details like ‘full figure’, ‘face’, ‘bust’, ‘feet’ and ‘sex’. All points are evaluated critically for calculating the intelligence quotient (IQ). 15 years and 5 months is the upper age limit mentioned in this scale – about the average age of class 10 participants. There is no time limit and it could be comfortably administered to groups of students.

### **Style of Learning and Thinking-SOLAT.**

Diversity in preference of the brain’s ‘right and left hemispheres’ in the way of dealing with information has been termed ‘learning and thinking styles’ by Paul Torrance (1980). Dr.D.Venkatraman’s Administrator’s Manual’ was used. This tool comprises 100 statements outlining 50 choices each for ‘right brain and left brain’ preference. Items from number 1 - 25 score is the preferred ‘learning style’ in choices like-‘class, content, interest, learning and verbal’. 26 - 50 numbers in items calculate the ‘thinking style-Creativity, Problem solving, Logical/Fractional, Divergent/Convergent and Imagination. Scoring is made easy by the built-in scoring key of SOLAT.’

### **Population and Sample**

Participants were from four schools in the twin cities of Hyderabad and Secunderabad, Telangana. 306 participants of 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup> classes, from Private, Government aided, only girls, co-educational institutions,

following State board and CBSE syllabi were included. Students lacking in study skills or struggling to keep up with the standard were included.

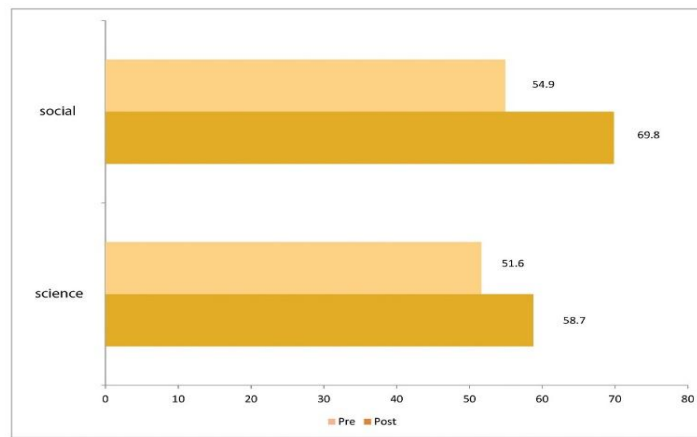
**Procedure**

Workshops including teachers / students to familiarize them to the idea of Mind Map concepts were organized. Power Point presentations assisted by 'I Mind Map software' Version 7 and practice trials took place. The rules of Mind Mapping according to Tony Buzan- blank pages, start center, organic branches and 'key words', use of minimum 4 'colours' were exhibited. Base-line scores for Intelligence, styles of Learning/Thinking and marks were gathered.

Cognitive Mind Map sessions coinciding with lessons completed were held periodically for the participants. Science and Social subjects were chosen. Participants were supervised during the creation of Mind Maps along with the presence of the respective subject teachers. The time taken for each session was 2 periods or approximately 90 minutes. 10 sessions during the academic year took place.

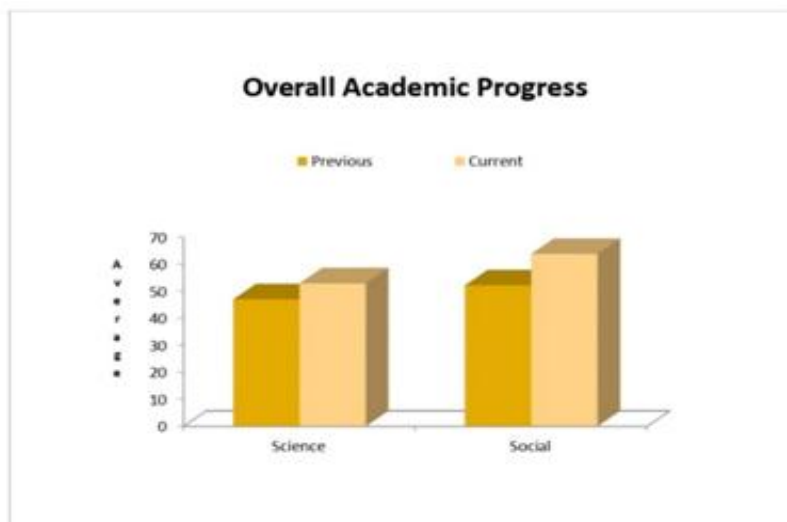
**III. RESULTS**

Tabulation of results of IQ scores, scores of 'learning and thinking styles'-'pretest and posttest' was done. Results of the summative tests were compared for pretest and posttest scores. Results were first computed on the mean scores in a small number of 31 participants, changes in 'learning and thinking styles' studied.



**Figure 1-** Pretest-Posttest Comparison of Mean for 31 participants in Science and Social Subjects.

Then SPSS (Statistical Package for Social Sciences, Version 20) was used to calculate the results for the 306 participants (Bhoopal 20



**Figure 2-** Academic progress in the 2 subjects of Science and Social Studies, 306 participants.

Descriptive Statistics and Inferential statistics – paired t-test, one way analysis of Variance (ANOVA), also Chi-square test was available, to inspect association of ‘Learning /Thinking styles’ in accordance with Gender, School, Curriculum, Class, IQ. Results showed improved academic performance in General science and Social studies as indicated by the figures. Referring to the Hypotheses, the results show Cognitive Mind Maps were more effective in the Social Studies subject compared to the General science subject at ‘a significance level of 0.01’ (Bhoopal, 2017).

### **Case Studies**

Case studies involve repeating measures and manipulating independent variables. Case study assessments may be used to examine causes and relationships in-between an ‘intervention’ and an outcome. They may be utilized for reporting results of different experiments with unique interventions when not being the research method used itself.

Ms. J.M. was an extremely achieving pupil. Her marks exhibited an increment of 86 per cent to 89 per cent in Social studies and 84 percent to 86 per cent in General Science. Her pretest scores in ‘learning style’ were 13 for ‘right hemisphere’ (‘right brain-RB’), 7 for ‘left hemisphere’ (‘left brain-LB’) and 4 for integrated hemispherical activity (integrated brain-IB), post test scores were 9, 4 and 12 (‘Right brain, Left brain and integrated brain.’). Pretest scores for ‘thinking’ style showed 6, 5, 14 (RB- LB- IB). Posttest they showed 5, 5 and 15 (RB- LB - IB). These results show a definite shift in ‘learning style’ towards left brain hemispherical activity while no appreciable change in thinking style is present. The feedback form indicates ‘recall of information’ as ‘the area’ were ‘Mind Maps’ helped her. Feedback from teachers indicated she was less worried and her personality showed more self-confidence after the training.

The unusual case of Ms.H.P. presented no change at all in learning and thinking styles pre and posttest. Pretest learning style scores were 14, 8 and 3 (RB- LB - IB) and the same posttest. Her pretest thinking style scores were 16, 3, 6 (RB- LB--IB) and precisely the same post training. She attended a small private co-educational school (one section per class) where the strength of the class was only 22. Her marks averages in Social studies showed an improvement from 51 to 65 (14 ‘per cent’) and in Science an increment from 45 to 54 (9 ‘per cent’). Conclusively, although no changes in thinking and learning style scores were evident, using Cognitive Mind Maps still had a definite, emphatic effect, reflecting an increment in marks in the two subjects.

Student Ms.T.D. exhibited low to average marks in General Science and Social Studies. Her IQ fell in the ‘dullness’ range of the study. Scores pretest in thinking style were 14-8-3. (RB-LB-IB) and after intervention were 15-8-2 (RB-LB-IB). Learning style pretest scores were -8-17-0 (RB-LB-IB), while ‘posttest’ scoring showed 11-14-0 (RB-LB-IB). A shift towards ‘right hemisphericity’ is evident though small. Identifiable increments in marks in the two subjects were seen- 3 percent increase in the subject of Social Studies, though less than the 9 ‘per cent’ increase in General Science. The learning style of the participant pretest, posttest, showed a marked leaning towards left hemisphere. Concurrently the marks showed more increase in the Science subject than in the Social subject. This would correspond with the functioning of the left hemisphere of the brain involving reasoning, logic, and numericals.

## **IV. DISCUSSION**

In case study one –Ms.JM showed a shift in learning style towards left hemisphere while a major proportion of students showed an increase in right brain learning. She was already an excellent student who requested to be included in the program. Her marks showed an increase in averages which is positive, but more significantly the changes in personality (Oral feedback from teachers) more self-confidence and less anxiety was noted. While self-esteem and anxiety levels, Personality measures, were not variables being studied in this research, they may be included in future research in relation to Mind Maps.

In case study two, Ms.H.P. showed no changes at all in Learning, Thinking styles but a marked improvement in performance. Case study three—the findings support the objectives of the research, and show that even students in the ‘dullness’ range of IQ benefit from the new techniques of Teaching and learning.

Case studies allow the researcher to observe changes closely at individual levels adding to the quality of experimental studies. They become tools for assessment of causal links between variables in participants and their environments. They are useful and effective in gauging the impact of an intervention on individuals.

### **Limitations**

Limitations of the research encompass the fact that only the students from the 8<sup>th</sup>, 9<sup>th</sup> and the 10<sup>th</sup> classes of private and government- aided schools having English as the medium of instruction were included. The participating schools were those following ‘State’ board and ‘Central Board of Secondary Education’ Syllabi and not those following ‘Indian Certificate of Secondary Education’, ‘International Baccalaureate’ and others. Thus it is not representative of all categories students from 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> classes.

## V. CONCLUSION

The research examined how Cognitive Mind Maps may be effective in academic achievement as a visual representation of textual lessons. The importance of 'colour' in Mind Maps was reviewed. Experimental work and the results and analyses of Mind Maps as an intervention were examined. The efficacy of Mind Maps and the resultant changes in learning and thinking styles were studied. Individual case studies were inspected for variances within results and related links in variables. New insights appeared, giving directions for future research studies and regarding the effects of Mind Maps on different student cross sections and relating to learning and thinking styles using Mind Maps. The case studies were useful and effective in appraising the impact of Mind Maps on students in High Schools.

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