Concept Mapping : A Tool to Improve Conceptual Understanding of Students with Hearing Impairment

Dr.THOMAS FELDMAN

[1] Department of Education, University of Allahabad

Prayagraj-211002, Uttar Pradesh, India

[2]Faculty of Education, Kamachha, Banaras Hindu University

Varanasi-221010, Uttar Pradesh, India

Correspondance Author : Sheelu Kachhap, Department of Education, Faculty of Arts, Senate House Campus, University of Allahabad,Prayagraj-211002 Uttar Pradesh, India

Running Title: Concept Mapping & Hearing Impairment

Abstract

Vision is one of the most preferential modes for the learning concepts. The main objective of this study is to examine the impact of Concept Mapping as a learning strategy on the conceptual understanding. The Quasi-experimental study was conducted among 09 Students with Hearing Impairment (SwHI) of Varansi district. The result of the study showed that there was a general increase in the conceptual understading score after using concept maps. In addition, it was found that there was a statistically significant differences between the means of pre and post-concept map scores in favor of post concept map scores. The finding revealed that the concept mapping has a noticeable impact on students' conceptual understanding. Furthermore, provide valuabe evidence for establishing concept mapping as a continuous teaching and learning strategy for SwHI.

Key Words: Concept Map; Conceptual Understanding; Student with Hearing Impairment

Introduction

> *"If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly."*
>
> (Ausubel, 1968)

The Concept Map method was developed by Novak and his group (Novak & Cañas, 2006) is based on the Ausubel Meaningful learning theory which assured that new knowledge is constructed by the connections to the prior knowledge (Ausubel, 1960). Concept mapping is visual, graphical learning tool that uses diagrams, texts to represent a particular knowledge domain and the relationships between concepts. Learners use different ideas to explore concepts, organize and represents the concepts in a logical manner that reflects the learner's adequacy of the entire knowledge structure. In other word, it is mainly through the visual modality human beings receive accurate and gestalt impression of the environment, assisting them in orientating towards the environment (Sen, 1998). Piaget, a great empiricist, has widely acknowledge the importance of the senses for the mental presentation of the objects in the mind of a child which, in turn, work as a building block for the higher order of mental abilities. Vision is important in the formation and refinement of the concepts. A concept can be defined as –"*An idea or mental image that allows for things which share common properties to be grouped together or categorized*." (Oden, 1987 as cited in Cañas et al., 2016 p.129). Actually, vision appears to influence the psychological/cognitive process like: perception, recognition, meaningful association and problem solving, which ultimately influence the cognitive abilities, because these process works as building blocks for the development of cognitive abilities (Sánchez & Flores, 2010). In addition, Marschark et al., (2013) mentioned that deaf students are visual learners or

visual style of teaching-learning can enhance their performance. This is because the deaf children have to pay too much attention for lip or speech reading while listening to others. This is besides simultaneously looking at the teachers' face, board as well as the teaching aids. So deaf childrens' eye get tired of concentration and this is called concentration fatique.

Language is the basis for the better understanding of educational concepts. The poor conceptual understanding hampers the educational performance of the students. If a student is able to understand the concept in books, he/she can easily interpret it in their own language but if not then it will be very difficult for them. The SwHI are brought up in the environment where they have limited access to language, reading and world experience (Andrews & Mason, 1991). Consequently, the SwHI has diverse language needs and face various diificulties in comprehension like concepts understanding, syntax and applying metacognitive reading strategies (Andrew & Mason, 1991; Strassman, 1997; Paul, 1998; Kelly, 2003). Therefore, a teacher/special educator is required to plan and implement instruction that respond effectively to their conceptual understanding.

Learning using auditory inputs by means of human reader or speech technology is oftenly insufficient for the Students with Hearing Impairment because it lacks the visual text support that makes suitable for the normal readers. It should also be taken into account that Students with Hearing Impairment usually have "*visual intelligence*" and thinks over *"images"* so that it seems logical to utilize their preferred learning style. Concept maps is also an important tool because their characteristic complement the learning difficulties caused by the hearing impairment and can enhance the particular point of strength as listed below characteristic (Abe James, 2003 as cited Lami, 2008) :

It provides the information in the visual domains.

Concepts are connected together with labelled relationship in a meaningful manner.

The organization of the concept map is free from the rigorous grammatical and syntactical structure of sentences.

Images and colours used in the concept map elicit the ideas to facilitate the meaningful learning and memorizations.

A larger amount of information can be shown graphically in the Concept maps using a lesser amount of language with more conceptual clarification.

All the above mentioned characteristic of graphical tools can play a significant role in conceptual understanding for Students with hearing Impairment due to poor schemta experience and having difficulties in processing the text, understanding the syntax,the concepts and structure of the text. However, very few research evidence exists regarding the role of concept map as an educational strategy in teaching of SwHI and students with special needs. Magda Nikolaraizi (2012), explored the effectiveness of concept maps in reading comprehension of a 10 yeard old deaf student. The result showed the instruction on concept maps improved the students' reading performance, as indicated mostly in text recalls. Also, the study conducted by Castillo, Mosquera and Palacios (2008) explored the effectiveness of concept maps to foster reading comprehension skills in a 13- year-old deaf student. They compared the comprehension of a text with comprehension of its transcription to a concept map format, both with and without illustrations. The result showed that the concept map format improved the students' understanding of the text and also motivated the students' interest more so than the textformat. In addition, A study conducted by Baldoni Maria Oliva & Berionni Antonietta in 2012 entiled concept maps and learning disorders has demonstrated an improvement in the performance of students and a reinforcement of their cognitive and metacognitive skills. A child with Aspers's syndrome has

achieved a positive growth at social and cognitive level by the use of concept maps used in interactive and collaborative teacher settings. More over, Askin Asan (2007) examined the effects of incorporating concept mapping on the achievement of fifth grade students in science class. The students were tested with teacher-constructed pre and post tests containing 20 multiple-choice questions into the experimental and control groups. The findings from the from the study showed that concept mapping has a noticeable impact on student achievement in science classes. Furthermore, Kalpana Kharade & Sybil Thomas (2006) conducted the study entitled looking for an alternative strategy for teaching and testing: an experiment with concept mapping in an inclusive science classroom. The study has a significant impact on the scholastic profile of the learners, concept mapping technique proved to be and to cherish, appreciate and celebrate the diversities among the learners.

Considering the limited research, this study aims to express the efficacy of its usage in increasing conceptual understaning of students with Hearing Impairment and meanwhile, going to find out the new dimensions of its use.

Method

The main objective this study is to examine the impact of Concept Mapping as a learning strategy on the conceptual understanding and the concominant objectives are (a) to develop Conceptual Understanding Test (CUT) and (b) to design and implement a science instructional unit based on concept maps.

Research Design

The research design was Quasi-expermental with the pre and post test.

Sampling

The purposive sampling was used by the researcher. The population of the study was the SwHI studying in the special schools of Varanasi city. A classroom of 09 Students of Hearing Impaired Studying of Standard V participated in the study.

Research Tool

To measure the Conceptual Understanding of SwHI a test was developed over the selected content i,e Skeletal System (कंकाल तं , Kankal Tantrant) from Vth grade science curriculum text book. Initally, the test consisted of 20 questions but after the teacher consent and the expert three questions were removed and finaly the test was consisted of 17 questions of one point each. The test consist of the four parts: (i) Multiple choice (ii) Fill in the Blanks (iii) Match the following and (iv) True and False.

One marks was given for the correct answer and zero marks was given for the incorrect answer.

Procedure of the Study

The fundamental challenges that we faced as interacted with these students was the locus of control in the teaching learning process from the teacher to student due to traditional teacher centered mode of instruction as well as absenteeism amongt the students.

Therefore, the researcher decided to work with the trainee teachers city of Varanasi and were allotted to that particular school for practical trainee period. The role of these mentors was to direct, encourage and facilitate the learning process. The study comprised of three phases: (i) Training & Instruction of the mentors (ii) Preparation of the school students for the concept mapping activity. (iii) Introducing concept maps as a teaching learning tool for learning science subject which included the topic –" Skeletal System (in hindi, कंकाल तं , Kankal Tantrant)''as given the fifth standard text book. The subthemes consist of the brief introduction about the skeletal system and bones of the skeletal system.

After a series of ten sessions the researcher observed the classroom teaching of the SwHI taught by the mentors to assess the mastery of their content as well as the technique of concept mapping.

Adminstration of the Tool

The CUT used as a pre test after the conventional method of teaching. In the next stage, the course was presented in the form of concept mapping and teaching (Appendix 1 & 2). At the end teaching the concept maps of skeletal system presented were summarized and integrated for learners by the use of concept map (Appendix 1& 2) and after finishing the same CUT was used as a Post test.

Result

The table 1 reveals that, for both pre-test and post-test p-value is higher (all $p > .05$, Kolmogorov-Simirnov test), and it was concluded that scores were normaly distributed. Therefore for testing research hypothesis parametric tests (Paired Sample t -test) was used.

Table 1: Evaluation and feasibility of statistical test

Variable	p - value	result
Conceptual Understanding before training	0.675	normal
Conceptual Understanding after training	0.686	normal

Objective 1: To study the effect of concept mapping as a learning strategy on the Conceptual Understanding of the SwHI of Vth grade.

The score shown in the table 2 explain that the Students with Hearing Impairment performed proportionately higher after using Concept Maps. There was a general increase in the conceptual understading score after using concept maps from ($M = 9.55$, $SD = 4.18$ to $M = 12.33$, $SD = 4.27$). This would imply that the use of Concept Map in teaching has a relative edge over the

conceptual understanding. For the purpose of investigating the effect of concept mapping as a learning strategy on the conceptual understanding of the SwHI, the mean of pre and posttest score were analysed by using Paired Sample t-test. It was found that there was a statistically significant differences between the means of pre- and post-concept map scores in favor of post concept map scores ($t(9) = -5.625$; $p < .05$).

Table 2: Mean Score of Students' Conceptual Understanding before and after the use of Concept Mapping

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	9.5556	9	4.18662	1.39554
	Posttest	12.3333	9	4.27200	1.42400

Discussion

Consequently, it seems that Concept Mapping have effects on the conceptual understanding of Students with Hearing Impairment. Studies on various Concept Mapping in the literature also support this finding.

There are similar findings in the study conducted by Castillo; Mosquera and Palacios (2008) & Magda Nikolaraizi (2012) also showed that the instruction on concept maps improved the student's reading performance who are deaf or hard of hearing.

The significant difference among the score of studnents conceptual understanding may be explained due to the fact that learners having the benefits of visual information and learn to exploit visual aids effectively in order to enhance their Conceptual understaning. Previous researches (Chmielewski & Dansereau, 1998) has showed that prior knowledge and training regarding graphical tools affect students' ability to use them effectively. In addition, images and colours used in the concept map create a visual representation of the concepts within the text, the

relationships among them and the text structure (Sturm & Rankin-Erickson, 2002) that facilitate the meaningful learning. The findings is futher supported by the study conducted by Lagowski (1990) and found that students usually retain 10% of what they read, 26% of what they hear,30% of what they see, 50% of what they see and hear,70% of what they say, 90% of something they say while they doing a task. Concept Mapping is a tool based on the visual learning methodology that helps students think, learn and achieve demands the learner to make an effort to understand the concept meaning, organize concept and form a meaningful relationship between them. Engaging of learners in such constructive approach during learning enhances memory and recall for the learned material. Visual learning is archieve the information from illustrations, photos, diagrams, graphs, symbols, icons and other visual models.

Conclusion

This study provides an additional insight into prior research concept Mapping and its effect on Conceptual Understanding of Students with Hearing Impairment. The finding revelaed that the Concept Mapping has a noticeable impact on students' conceptual understanding. This study has implication especially for the teachers of hearing impaired students where language acts a barrier for the better understanding of educational concepts. Using Concept Map will help students to develop better understanding of an important concepts. An effective use of concept map requires the the systematic instruction on the strategic use of the concept map. By making students aware of the value of visual aids and instructing them on how to use them strategically to enhance their Conceptual Understanding.

In summary, this study indicates that concept maps works as a tool to improve conceptual understaning of Students with Hearing Impairment whent it's presented visually. The map support both constructivist teaching and learning approaches and may have wider applicability to the work among the Special Needs Children.

Acknowledgements

We would like to thank the principle ,the class teacher and others staff members for offering us the perfect research environment and trainee teachers for providing the assistance in the classroom teaching.

Conflicts of Interest

The author(s) declare that there are no financial or others conflicts of interest associated to this work.

Funding

Sheelu Kachhap was supported as Senior Research Fellow under the Maulana Azad National fellowship (vide letter no: F1-17.1/2014-15/MANF-2014-15-CHR-JHA-40227) scheme sponsored by the University Grant Commission (UGC), Government of India

References

Andrews, J. & Mason, J. (1991). Strategy usage among deaf and hearing readers. *Exceptional Children*, 57, 536−545.

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. (1960). The use of advance organizers in the learning and retention of meaningful verbal material. *Journal of Educational Psychology*, 51, 267−272.

Ausubel, D. P. (1968). *The Psychology of Meaningful Learning*. New York: Grune& Stratton, Inc.

Oliva, M. B., & Antonietta, B. (2012). Concept maps and learning disorders. Concept Maps: Theory, Methodology, Technology. *Proceedings of the Fifth International Conference on Concept Mapping* Valletta, Malta, Retrieved from http://cmc.ihmc.us/.

Cañas, A. J., & Novak, J. D. (2006). Re-examining the foundations for effective use of concept maps. In A. J. Cañas, J. D. Novak, Eds. (2006). Concept Maps: Theory, Methodology, Technology. *Proceedings of the Second International Conference on Concept Mapping*, San José, Costa Rica, Retrieved from http://cmc.ihmc.us/.

Castillo, E., Mosquera, D., & Palacios, D. (2008). Concpet Maps: A Tool to improve reading Comprehension skills for children with hearing Impairment. In A. J. Cañas, P. Reiska, M. Åhlerg & J. D. Novak, (Eds.). I*nternational Conference on Concept Mapping,* Tallin Estonia & Helsinki, Finland. Retrived from *http://cmc.ihmc.us/cmc2008 papers/cmc200-p247.pdf.*

Chmielewski, T., & Dansereau, D. (1998). Enhancing the recall text: Knowledge mapping training promotes implicit transfer. *Journal of Educational Psychology*, 90, 407−413.

Kelly, L. (2003). The importance of processing automaticity and temporal storage capacity to the differences in comprehension between skilled and less skilled college-age deaf readers. *Journal of Deaf Studies and Deaf Education*, 8, 230−249.

Kharade, & Thomas, S. (2006). Looking for an Alternative Strategy for Teaching and Testing: An Experiment with Concept Mapping in an Inclusive Science Classroom. Proceedings In A.J. Cañas, Novak J. D. & Gonzalez F. M. (Eds). *First International Conference on Concept Mapping*. Pamplona, Retrived from http//:cmc.ihmc.us/.

Marschark, M., Morrison, C., Lukomski, J., Borgna, G., & Convertino, C. (2013). Are deaf students visual learners? *Learning and Individual Differences*,25, 156−162.

Lagowski, J. J. (1990). Retention Rates for Student Learning. *Journal of Chemical Education*, 67, 811−812.

Lami, G. (2008). Dyslexia and Concept Maps: An Indispensable Tool for Learning. Concept Mapping: Connecting Educators. *Proceedings of the Third International Conference on Concept Mapping* Tallinn, Estonia & Helsinki, Finland, Retrieved from http://cmc.ihmc.us/.

Nikolaraizi, M. (2012). The strategical use of concept maps in reading comprehension of students who are deaf. Concept Maps: Theory, Methodology, Technology. *Proceedings of the Fifth International Conference on Concept Mapping* Valletta, Malta, Retrieved from http://cmc.ihmc.us/.

Novak, J. D., & Cañas, A. J. (2006). *The Theory Underlying Concept Maps and How to Construct Them* (Technical Report No. IHMC CmapTools 2006-01). Pensacola, FL: Institute for Human and Cognition .Retrived from http://cmap.ihmc.us/Publication/ResearchPapers/TheoryUnderlying Conepts .

Oden, G. C. (1987) as cited in Cañas, A. J., Reiska, P. & Novak, J. D. (2016). Is My Concept Map Large Enough? In Alberto Cañas, Priit Reiska, Joseph Novak (Eds.), *Innovating with Concept Mapping, Communications in Computer and Information Science*, Tallin, Estonia: Springer, 635, 128−143. Retrieved from http:libgen.io/ads/php?

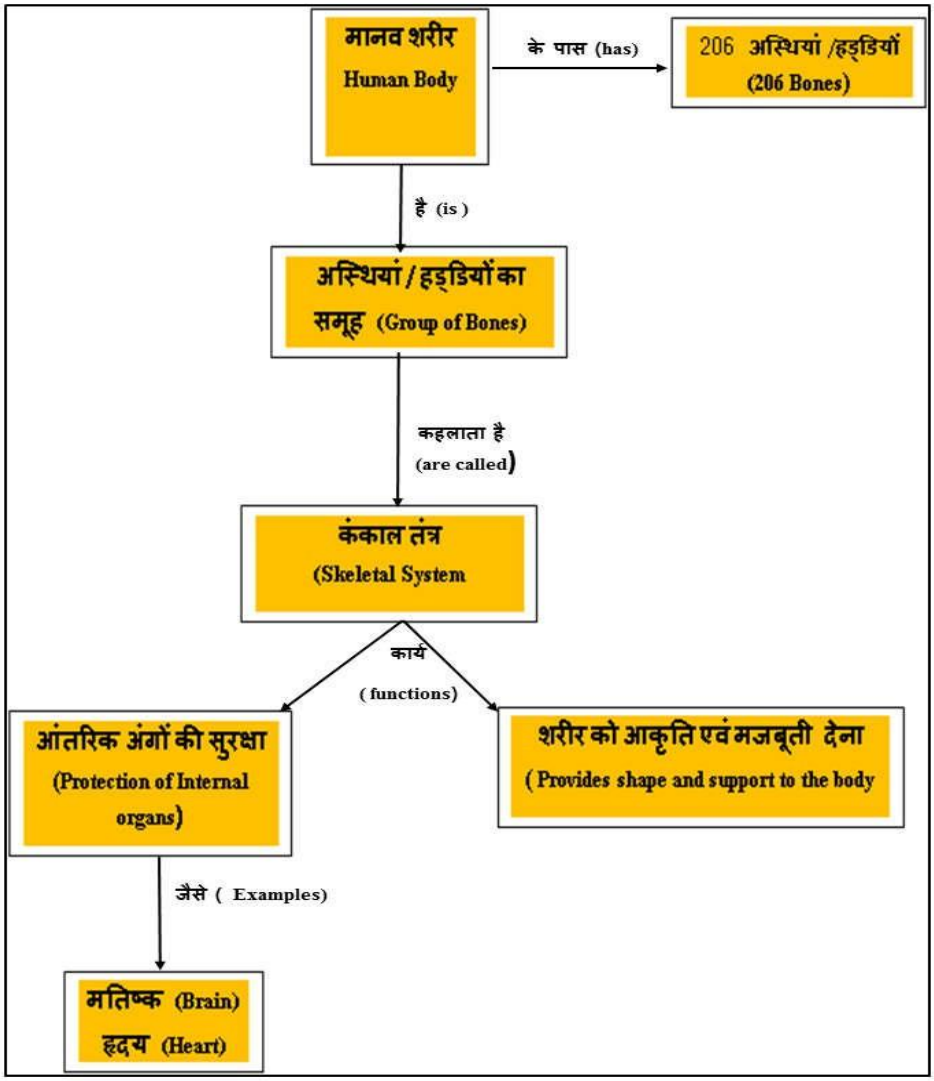
Paul, P. (1998). Literacy and Deafness. *The development of reading, writing and literate thought.* Boston, MA:Allyn & Bacon.

Sánchez, J. & Flores. (2010). Concept Mapping for Virtual Rehabilitation and Training of the Blind. *IEEE Transactions on Neural System and Rehabilitation Engineering*. Vol 18 (2).

Sen, A. (1988*). Psycho-social integration of the handicapped: A challenge to the society.* New Delhi: Mittal Publications.

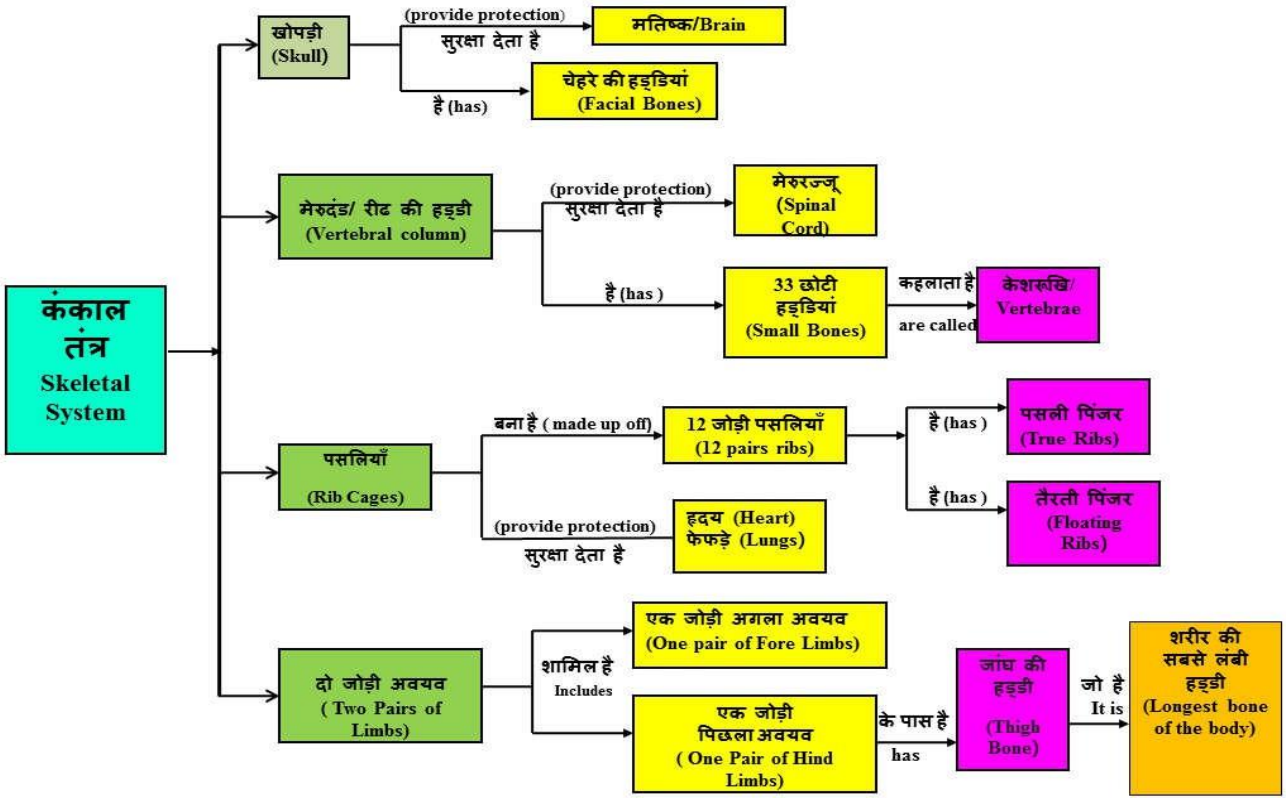
Strassman, B. (1997). Metacognition and reading in children who are deaf: A review of the research. *Journal of Deaf Studies and Deaf Education*, 2, 140−149.

Sturm, J. & Rankin-Erickson, J. (2002). Effect of hand-drwan and computer - generated concept mapping on the expository writing of middle school studnets with learning disabilities. *Learning Disabilities, Research & Practice*, 17, 124−139



अवधारणा मानचित्र (Concept Map)

Appendix 1: An Investigator constructed concept map for concept mapping activity 1



Appendix 2: An Investigator constructed concept map for concept mapping activity 2