

Restructuring Perceptions of Geographical Knowledge and Experience Among Learners Under a Concept Mapping Domain

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Abstract

Alexandra K Transfer quoted, "The best teachers are those who show you where to look, but don't tell you what to see". While teaching merely rests on art but it connotes into science wherein imaginative minds are ignited for knowledge. Pedagogy and enriched content are dependable solutions for effective teaching and learning. Real meaningful learning is the focus of modern teaching which follows a constructivist approach. Bygone are the days when the traditional lecture method was sufficient to teach the pupils. Advanced technologies have been the replacement of the monotonous lecture method in Geographic studies. The pupil now constructs their knowledge by engagement, exploration, explanation, elaboration and evaluation methods. Different pedagogical practices are involved, like the enquiry approach, reflective strategy, collaborative learning, etc., among which concept mapping is one of the important strategies applied in Geography teaching. It is a graphical organiser which connects links between the two or more concepts in some logical, sequential flows. Concept Mapping effectively assists in achieving the learning outcomes. Learning outcomes are the assessment standard that indicates the expected level of learning that learners should achieve for that particular class. Many concepts of Geography dealing with exhaustive knowledge about nature and processes in nature are prudently taught with the concept mapping approach. These maps make a vivid picture of illustrated concepts in learners minds assuring thus, a rigorous and long-lasting rationalisation of content knowledge. The paper highlights one of the robust, innovative strategy of modern pedagogy in Geographic studies where the chain linkages in concept mapping provide an enriching experience of learning nature and natural phenomena.

Keywords: Pedagogical processes, Geography, Learning outcome, Concept mapping

Introduction

The 21st century is the age of information technology, where teaching technologies provide several pedagogical approaches and numerous strategies for teaching specific content. Teaching-learning activity has now been directed for a learner-centric approach where an ample amount of space is given to the learner to learn at his own pace (Quazi, 2020). The teacher as a facilitator, has a responsibility to mould his learners most creatively. He has to look upon the effectiveness of conveying ideas to create a long-lasting impression upon children's minds. To tackle these challenges effectively, the teacher should implement innovative ideas that would enrich classroom experiences. Teaching trends based upon a new approach known as constructivism has drawn more attention recently, where learner get the chance to construct his knowledge. Various innovative ideas/strategies foster the creativity of a learner.

Some of these innovative strategies are in brief as:

1. Creative teaching: Playful games, visual exercise, etc., will ignite young minds and generate curiosity and interest in them. This is a period of examination where every mind's creative abilities are identified. The teacher encourages different ideas, gives them the freedom to explore.
2. Audio-Video Tools like Models, Film-strips, Movies, Pictures, Info-graphics, or other mind mapping and brain mapping tools that help their imagination thrive and grow. These methods assist in understanding the defined concepts in the learners. Conducting Online discussions or playback recordings of public lectures etc., also make the learning easy and conducive. Nowadays numerous smart Apps are available for this methodology. Towards integrated approach of technology in exploring knowledge. An awesome slideshow or PowerPoint Presentation can be created for effective lecturing.
3. Real-world learning is also infused with classroom teachings, and student's interest is sparked when content is related and demonstrated through real-life situations. It makes easy, conducive, and everlasting learning.
4. Brainstorming is another innovative strategy. Such sessions exaggerate the creative juices of the young mind to flow out. Multiple brains focus on a single conceptual idea and result in numerous ideas thrown out of inquisitive minds. Students develop words and expressions of their thoughts.
5. Classes outside the classrooms are also one of the important aspects of innovative teaching. Field visits, field-trips relevant to the content help students towards refreshing and exciting learning.
6. Role-play also develops the interpersonal skills of students. Here students get out of their comfort zone and play an active role in the interactive learning process.
7. Storyboard teaching: Highly conceptualised ideas can be memorised easily step-by-step with this mode of teaching practice. Teachers use storyboards, as a form of communication and let the students tell a story based upon these pictures using their full swing of imaginations.
8. Collaborative and cooperative strategy, concept mapping, experiential learning are all other innovative teaching techniques alongside many others for better academic gain.

Thus, various pedagogical practices involve a blend of teaching technology, leave a lasting impression upon the innovative minds of learners. These strategies are adopted to ensure a significant learning outcome. This paper discusses the concept mapping as an innovative strategy in Geography teaching and learning towards an exhilarating experience about Earth and associated recurrent natural processes of Earth through a befitting and congenial interaction with knowledge.

Theoretical Framework

Credit to develop Concept mapping goes in favour of Joseph D. Novak, a great American educator of Cornell university in 1970. He, along with his team, worked on the constructivist approach where it is assumed that learners apply their cognition and construct new knowledge via linking the prior information gathered during their past experiences. His work lies on the cognition theories given by David Ausubel, who was an American Psychologist who developed Advanced Organizer. He authored a book, "Learning How to Learn", elucidating the fact that cognitive structure in humans assimilates new concepts and frames propositions for meaningful learning.

Novak's concept mapping is well known supplementary tool for augmenting motivation levels among learners to learn and arousing attention and retention of the concepts for a considerable long duration (Eppler, 2006). Concept mapping is likely an effective quality full visual-mapping method of learning that catches an eye and leaves an imprint in the memory of an individual. Thus, assists in learning task/context/concept (Martin et al., 2000; Martínez et al., 2013; Novak, 1990; Novak & Cañas, 2008). Previous studies documented that concept mapping is most empowering tool to augment teaching-learning process that provokes meta cognition, and assists teaching and research skills among the stake holders. Learning among the pupils were monitored after the extensive use of concepts map during teaching. A study proved the quality

improvement in learning by the application of these concepts maps and therefore regarded as an indicator and predictors of meaningful learning (Åhlberg, 2013; Gerstner & Bogner, 2009; Güvenç & Açıkgöz, 2007; Kinchin, 2001). Moreover, in another study researcher examined the concurrent validity of the concept map and advocated that concept maps are driven like a vehicle to explore the conceptual changes in Biology. The study was done with control and experimental groups, which evidenced the substantial and significant change in the formation of base knowledge of the learners of the treatment group under study. Hence, concept maps considered as a most versatile and potential tool for knowledge acquisition (Wallace & Mintzes, 1990). Towards global advancement where knowledge is tagged as a superpower, the increasing complexity in educational, technological advancement needs a novel approach to integrate part and parcel of information for robust comprehension facilitating life-long learning. Concept mapping is credited as an indispensable learning tool for better academic learning outcomes. A study supported the successful implementation of Concept maps from the primary stage of learning till the higher and professional platform of education to integrate and simplify the intricacies of the concepts interconnected to each other. The study concluded to train and develop proficiency in concept mapping right from the initial stage of learning, i.e. primary standard which may prove as a scaffold for higher standard too (Schwendimann, 2015). Concept maps drawn by the students during teaching symbolises the understanding level of the students. Concept mapping reveals the extent up to which the learners could organise their knowledge after a lecture is delivered and to what level these concept maps could bring out the change in the cognitive structure of the learners to make learning effective and facilitated. It holds a promising idea to evaluate the learning level of the learners (Kinchin, 2001).

Several researchers suggested concept mapping as an instructional intervention directing the students to learn the concept in sequence, moving ahead from simple to complex level and found a very beneficial tool for assessment of learning. Further, it has proved its efficacy in teaching, learning and research (Nesbit & Adesope, 2006). An exhaustive

review study undertook meta-analysis for the effectiveness of the use of concept maps. It explored the augmented level of knowledge of the pupils. Students mastered the content through construction, modification and linking hierarchal concepts through arrows. A significantly high quantum of studies has been performed over the usage of Concept maps in the various discipline (Okafor, 2016; Okebukola & Jegede, 1988; Parikh, 2016; Patrick, 2011; Safayeni et al., 2005; Santhanam et al., 1998; Schmid & Telaro, 1990; Stoica et al., 2011; Tan et al., 2017). A meta-learning strategic concept has been evolved to modernise the pedagogical approach. Deducing the facts, it is undenied that the strategy holds an affirmative grip to empower the pupils in knowledge retention through learning at their own pace and with their attempt (Nesbit & Adesope, 2006; Novak, 1990; Novak et al., 1983; Novak & Cañas, 2008; Samaresh, 2017). Various studies have investigated concept mapping as a mode of knowledge acquisition and verified that students gain mastery of the topic under discussion in their classrooms (Fechner & Sumfleth, 2008; Trifone, 2006; Wallace & Mintzes, 1990). Using this strategy, a conceptual change was noted in the learners when they tried to restructure the existing knowledge in better visual form to assist learning assuredly. Several research studies documented the academic gain among learners in various domains by a novel approach of the pedagogy involving Concept mapping. Previous studies reported that concept mapping strengthens the communication among a peer group, and increases the confidence level to present their ideas more explicitly (Trifone, 2006). It reflects the big picture of the concerned topic under study. Besides learning and assessment tools, it aids in curriculum planning, in business deals, in communicating social messages among society and so on. The tool successfully implements recapitulation of the previous knowledge of pupils before an instructor proceeds to a new topic. It further assists teachers to find out loopholes existing in the concept of learners and rectify the misconceptions (Åhlberg, 2004; Bera, 2016; Slotte & Lonka, 1999; Tan et al., 2017). The constructivist teaching approach directs the learner to construct the knowledge, where they link the previously learned knowledge, construct

new ideas, re-organise the structure, explore the new possibilities, visualise the whole information in a glance to comprehend the content with speedy wave (Allen & Tanner, 2002; Balim, 2013; Buehl & Fives, 2011; Güvenç & Açıkgöz, 2007). It reflects the creativity of learners in visual mode of learning, which has been supported by many studies (Bera 2016; Buehl & Fives 2011; Chang et al., 2001; Martínez et al., 2013; Maznah & Ismail 2004; Patrick 2011; Okebukola & Jegede 1988; Okafor, 2016). Educationalists realized the difficulty of learners to utilise their mental abilities. Concept mapping was found effective in building the concept with a strong foundation where they learn how to learn and how to use their learned experience further, leading towards constructing and disseminating the new knowledge (Nesbit & Adesope, 2006; Patrick, 2011). It is further evidence that learning by visual tools has proved its efficacy among learners in grasping the content better than any other conventional method of teaching. Mind mapping is also a similar kind of strategy where the mental abilities of students are pulled out to reflect their inner thoughts (Liu et al., 2014). Education in the growing IT world focuses to enhance the cognitive skills of learners so that they could encode the information in a better way and directs the learner in processing, organising and retrieving information hence best-learning outcomes could be achieved (Stoica et al. 2011). Concept mapping in one way assists and improve the performance levels of the learners. In drafting a concept map, Cognitive skills revitalize the thinking pattern of pupils and instruct them to reflect their ideas in some pattern exhibiting relationships among each other. In one way, it monitors the appropriate sequential flow of information intertwined with the progression of conceptual comprehension. It is a self-regulating creative learning process where the students frame logical, authenticate and valid assertions/propositions linked in a hierarchical pattern (Bera, 2016; Eppler, 2006; Okebukola & Jegede, 1988; Fechner & Sumfleth, 2008).

Novak, 2004; Wandersee, 1990 their study demonstrated the effect of a novel instructional strategy for teaching biology when the learners were asked to draw a concept map in their way of thinking. Each student came out with their own

creative map according to their mental efficiency by displaying their knowledge content in varied ways. Different concepts inter-related in a network like structure thereat. A variant of such pedagogy polishes individual ability of learner along with enriched quality learning (Schmid & Telaro, 1990). An enquiry was further made in a research study to deduce the concept mapping as an operational configuration to elevate and enhance conceptual change among learners. Adoption of concept mapping at the beginning of the class gives an insight into pupil's preconceptions (Tan et al., 2017). This gives a fair idea to the teacher to begin the lecture from which level. Meanwhile, during learning process in-between the chapters of a particular unit, learners are asked to redraw concept maps. This revision technique provides misconceptions if held among the students to the teacher, hence it should assist the teacher to renew conceptual change if deemed needful among the whole learning process. Therefore, concept mapping is considered a reflective tool/ assessment tool or evaluating tool during the teaching process (Liu, 2004). Findings in another study reaffirmed the positive perception of students towards the use of concept maps. The strategy stood verified for the longer retention of the knowledge delivered in the classroom with its effective implementation. So, the Concept-Map is a two-dimensional visual illustration with appropriate relationships between key points in a concerned delivered lecture. Such meta-learning caters to simplify the complexities and remove the ambiguity linked with a new heading concept (Patrick, 2011).

Concept Mapping in Education System: Purpose and Prospects

Concept mapping is a powerful tool for students to reach high levels of cognitive performance. It is not merely for learning but also a type of assessment tool where achievement level and learning outcomes of students are being analysed (Åhhlberg, 2004). When students create concept maps, they generate ideas using their own words, and incorrect ideas can be easily identified. Educators easily get the points that students have learned, where is the loophole and lacunae in their entire learning. Thus learning, comprehension and writing skills are

strengthened by the integration of concept mapping techniques (Chang et al., 2001). This paper focuses upon using innovative teaching strategy, i.e. concept mapping by the teacher in Geography classroom to ensure optimum learning outcomes (Reitano & Green, 2012).

Further, how learners gain mastery over the geographical concepts and how better they could relate the theoretical concepts with real structure existing above and on the earth. Since mapping assists to detect the present status of acquired knowledge and how intrinsically a learner attains a understanding of the concerned topic, this article tries to explore the mapping of cognitive skills where a learner synthesises facts, and associate them with a relation illustrating a scientific knowledge hidden behind some academic enquiry. Learners, through such representations enhance their creativity and graphical metacognitive abilities. The cognitive power of the mind helps for how we know and what we know and link these titles or events, which is termed as concept hereat (Santhanam et al., 1998). In general, we can say the concept is a term used for any regular event or any sequential regular objects/steps/processes followed systematically. For example, a process of evaporation, condensation, formation of clouds, raining (A Process), A technique of extracting the mineral from ore (A Procedure), or formation of soil (A Product), anything which our mind thinks of and can create a structural visual image are to be termed as a concept. Likewise, “Weather Changes Due to Rotation of the Earth About Its Axis” is a concept to explore in Earth and Spatial Sciences. So, we can say that concept is a schematic layout with structural entities defining some sets of words connected with links from general to specific, hence forming an assertion or proposition (Novak, 1990; Patrick, 2011).

Constructs and Schematic Layout of Concept Map in Geographic Literature

A concept map is an effective application in the form of a visual learning tool arranged systematically to provide rapid information at a glance (Güvenç & Açıkgöz, 2007). It lays an overview of the topic focusing on the relationships and associations within the concepts. Concept maps depict and

present the knowledge/ Information in an organized and systematic manner. It explains the concept explicitly following hierarchically structured visual representation through the application of intensive cognition reflecting information in the regular fashion of smart patterns. These concepts are labelled with symbols or words. This creativity of formulation of concepts and connection with linking words to give it true meaning along with established inter-relationships between various maps segments organizes the knowledge in an effective manner (Trifone, 2006). A concept map is a type of graphic organiser used to organise the content and represent the relevant information of a subject. Here mapping of main ideas is done, which is specified further in sub-topics. It helps students to build core knowledge and clarification at the grass root level. It also assists in brainstorm and generates new ideas and encourages students to discover new concepts and integrate the older concepts with newer ones (Tan et al., 2017). It represents relations between different concepts by the use of graphic tools such as Workflow-diagrams, figures, neat drawn illustrations, etc., in an authentic and systematic sequential flow of knowledge.

Concept mapping can be done in various ways, viz. Spider Nets, Hierarchical Layouts, Flow-Chart Designs, Input-Output System, Workflow Diagrams and Frameworks of Chain relationships.

- Spider concept mapping is one in which the main topic is placed at the centre of the map and sub-topics extends from it as their fine branches.
- Hierarchy Concept mapping is made where the main topic lies at the centre and sub-topics beneath it.
- Flowcharts are adopted where information is organised in a linear format.
- System workflows followed where one proposes to add inputs and outputs at a definite point of execution of the process in the discussion.

Concept maps are typically hierarchical, with various sub-concepts or sub-themes that shoot out from the main concept or central idea. This Graphic organiser has scope for the addition of changes and a new concept when once already crafted. This is a three-step procedural flow (Novak, 2004; Novak, 1990):

- Focus upon the main idea, topic, or issue and frame the hierarchical structure of the concept map.
- Connect the main idea to varied sub-concepts. The most general idea will come first which is linked to smaller and more specific concepts representing a flow altogether.
- Finish it or culminate at a point by connecting links between general and specific concepts.

Instructional Pathways of Concept Map Structuring towards Efficient Learning Outcomes

Firstly, the teacher must give theoretical knowledge regarding the Concept maps (Figure 1) as to how to draw, how to use them, their benefits and how it enriches learning and facilitates a learning process along a continuum, ensuring optimality of academic enrichment. It deeply involves the Principle of engagement, elaboration, explanation and justification of ideas. Teachers assist learners in understanding the meaning, relationship between concepts, and in developing a framework for what they already know and finally letting them transform and integrate new ideas by the establishment of hierarchical relationships among the concepts. The workflow adopts generalised ideas at the top of the hierarchy and specified concepts as the branches oozing out from the top. It is a tree representation of the whole idea underneath a broad concept. Concept mapping can also be used as Hands-on activity in practice sessions. Children start investigating the concepts with apt linkages with their prior knowledge. It uses graphic tools such as figures, diagrams, flow-charts and workflow diagrams to present relationships between concepts and generate interfaces among different attributes and variables in a process encompassing a difficult concept.

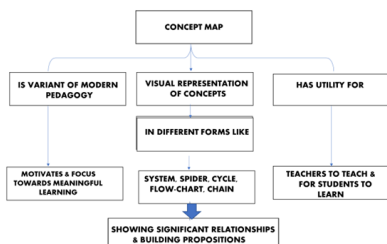


Figure 1: Overview of Processing of a Concept Map and Linked Objectives

Nowadays Concepts maps construction is attracting stakeholders towards its usage as it can be smartly drawn through various digital tools readily available in the open source domain. Freemind, XMind, Cmap, Cacao, Glyphy, Google Docs, Coggle, Compendium, Docear, Freeplane, MindMup, SciPlore, Mind-Mapping, Wikka Wiki, Word Processing Softwares (MSWord, Open Office) and Presentation Softwares (Power Point, Open Office, Impress) etc. These digital tools provide alternatives to create concept maps in different ways. Each tool has its specifications and can be utilised accordingly as the need arises. The most widely used tool is Cmap tool which was developed by the Florida Institute for Human and Machine Cognition (IHMC). It facilitates the visual display of ideas structured in mind effectively and efficiently (Novak & Cañas, 2008). This software ascertains personal and collaborative learning thus, building a base knowledge. It explicates knowledge to create and manage the information. Students can easily learn how to use the Cmap tool. Any shape can be dragged and dropped as per the wish and requirement, then get connected with usage of different lines and arrows. Hyperlink can also be inserted if one wishes to connect it to diagrams or other information like picture, video-clips, etc. Usage is highly appreciable and workable among the youth learners as it is like learning how to learn creatively, persistently and more accurately (Wallace & Mintzes, 1990).

Professional Progress of Geography Methods and Curriculum Enrichment

Geography as seen for “Geo” meaning the Earth and “Graphy” reflecting to map in Greek or describe the Earth is known for its science of spatial distribution and areal differentiation. Ever since its birth it is regarded indisputably as mother of all subjects as all the different disciplines ascertain their respective roots of origin from this central subject as cardinal branch of knowledge. It is this Geographical core that led to independent existences of various form of individual disciplines with time and in space. It deals with the study of landforms with an abundant account of all that exists above it and in oceanic-sea waters affecting earth’s distinctive features, events of earth as well as other planetary bodies, natural and

man-made resources on earth and the distribution of inhabitants with revelation of man-environment relationships. Geography, thus undertakes to map about the earth including, all that which appears upon it either physically carved out or achieved through man as an agent of change (Wandersee, 1990). It shall be appraised that Geography has its nature much diversified and scope vast in dimension. Inquisitive readers and serious researchers of geography shall not be satisfied as a man of exploring and learning for they do not limit their knowledge by surface features on the earth only. Geography upholds importance among all the branches of study as it provides organized knowledge to communicate in this world (Schwendimann, 2015; Slotte & Lonka, 1999). It provides for a universal language to comprehend the planet where we live, and sustain with ample reasons for existence of our life. It resolves all the question as Where, Why, How and What if and if not; form a logical base of every query raised and answer sought for.

Looking towards the importance of Geography as an inter-disciplinary subject it is quite mandatory to focus upon different branches of geography, and further to teach geography with novel approach of teaching wherein students are motivated to learn the hidden treasures of this mother earth and the miracles of the heavenly bodies and other planets in making the possibilities of life, if any. Innovative pedagogies are now focused to disseminate the knowledge of geography explicitly (Reitano & Green, 2012). Concept mapping has found for a better aid to understand this subject holistically whereat all its concepts are explored and defined broadly. To all geography learners they must have a fair idea what geography is all about. A geographer must have a sound knowledge when the question arises that what is Geography? There could be many answers, and each answer is correct in its own way and has its own significance. It can be sufficiently understood for “Geography is a Place” where a location, its coordinates, and position of every object can be marked over this planet. It takes into account the physical and human characteristics over places and distribution of phenomena. “Geography is Human” when man is child in the lap of mother earth and nourishes in its soil. “Geography makes

Exploration” across varied latitudes and longitudes of earth, on land and in oceans, upto the unknown and underneath. “Geography is in Mapping” from floor of oceans to ridges on land. “Geography is towards Learning” about the relations between nature and society in the face of global challenges of finite and depleting resources of the earth. “Geography embraces Science” to explore the cause and effect relationship of any phenomenon enabling scientific progress through research. “Geography transcends Spatial Science” when dealing with Spatial distribution and differentiation through satellite imaging for earth observation, digital cartography and other such advanced technologies.

Thus, to understand the discipline profoundly, efficacious geography teaching skills are required where the syllabus covering all the subject content are easily grasped and comprehended well by the learners, involving higher order thinking while drawing concept maps. In all, it becomes inevitable to say that “Geography is Experience” one derives from the knowledge of planet earth that provides for everyone’s need and dictates the utter survivability of mankind.

Administration of Geographical Concept Maps Among Learners

The multifaceted tradition of disseminating Geographical knowledge has been set at the backdrop of a more conspicuous logical positivism and interlinked empiricism with the subject. When the world has cut across all barriers of technological advancement into a three-dimensional space of scientific understanding for an inspiring mind, the learning transcends another milestone of achievement in encouraging students to develop indomitable spirit of scientific enquiry in them. Students’ understanding of mere natural scientific processes and phenomenon develops through everyday experiences. They come to the classrooms and teachers help them to overcome their prior ideas and lead them for a more scientific understanding.

The teaching is greatly aided with strategies of concept-map designing to help students rationalize and restructure their perceptions after they encounter scientific understanding. The Concept Maps (Figure 2 to 5) outlines strategy of using concept mapping

by initiating the rainfall and completing the basic rock cycle (Figure 4) of Geological perspective. The work-flow can be maintained enough to reform any pre-conceived ideas in the minds of students towards massive conceptualization of phenomena as it really exists in nature. Hence, the summation of varied concept maps for the linkage of knowledge variables under this methodology exhaustively culminates at a broader and refined experience of the Geography one teaches to other through his lectures more fascinating than any conventional delivery (Patrick, 2011). The finest of illustrations and sufficient explanations arising from the creativity and innovative thinking forms the backbone of mapping a concept in Geography classrooms thus (Samaresh, 2017; Stoica et al., 2011; Tan et al., 2017).

The above few examples engage the Geography students in certain meticulous way of effective learning that creates a true inner need to know and desire for intended active learning in prospective scholars of the subject. These concept maps best illustrate the skills for a creative teacher who shall regularly choose, combine, re-arrange and gauge at pre-existing knowledge and skills of his students and upgrade their learning outcomes for enhanced expertise in the subject. This propels them to consolidate and augment their creative knowledge they experienced and mastered through his classroom deliveries (Trifone, 2006; Udeani & Okafor, 2012).

Perspective Transformations in Geographic Pedagogy: A Conceptual Change Reflection

Conceptmapping performances are manifestations of conceptual change theory advocated to sustain process of teaching and learning science. Appropriate to say that “Mapping for Conceptualization and Mapping towards Conceptualization” is the working hypothesis that overtakes any other premises to describe for here. The theory assumes that humans have some previous idea superimposed on their inner beliefs about science that may not be consistent with what and how it actually exists in nature under a scientifically held understanding. The concept mapping technique addresses and reforms these already set ideas in the minds of learners towards a more scientific rationalization of knowledge and hence, academic enrichment of experience

undergoes remarkable change (Okebukola & Jegede, 1988). True to these prospects of concept mapping in Geographic thoughts, teachers are key identifiers of existing ideas in their pupils and they guide them more specifically to articulate and discern that understanding for rational knowledge around us.

The Geographic delivery of content knowledge does not rest upon a teacher who is qualified in the discipline only but who is trained sufficiently for Geographical pedagogic content education as well. The wisdom of practice of effective teaching by Practitioners of Geography is instrumental in bridging the current and pre-held old understanding of students with alternative ideas leading to subsequent reformation in knowledge (Liu, 2004). These factual informative sheets in the form of Concept-Maps are organized in a way to address a framework developed for providing an interface to learners for integrating what they know and what they should know. On one hand wherein the teachers find these concept maps beneficial for them to reflect about their teaching, the students on other side derive their own set of comparisons between their mentors’ teaching and what they knew so far. Towards professional development and as agent of knowledge transformation, the Geography teachers are the interlinks of chain across variables of content-knowledge, its delivery, understanding, skills and set of values and attitudes attached to Geographical education worldwide (Novak et al., 1983; Reitano & Green, 2012).

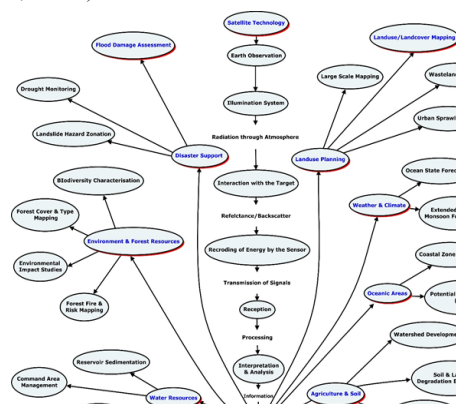


Figure 5: Explanations of Satellite Technology for Earth Observation and Demonstration for Its Various Application through Concept Mapping Approach

In (Figure 5), the flow in content from basic to more specific one and an overall transformation of ideas are depicted through a useful concept map in Geography class on the theme- “Application of Satellite Technology”. Initially the students shall have vague misconceptions of these concepts or may have little to no understanding of this theme. The teacher wishes to work on delivering on the application of remote sensing technology in world but without initializing on prior knowledge of what a remote sensing process is, the answers by students when confronted with this particular theme renders no possibility of knowing exactly what a scientist must know about satellite technology. The students cannot be connected to his/her pre-idea on this theme and misunderstanding of the concept will occur and classroom communications converges at no point of interest. It is by way of concept map (Figure 5) that finally the teacher guides them through a sequential flow of process from imaging earth from space by satellite technology and using the images so obtained for application in various sectors of human society with citing of some relevant examples. The teacher succeeds in how a student identifies relationships among science concepts. Hence, the overall efficiency in structural organization of content knowledge in these maps by Geography teacher is retained longer and the productivity in knowledge transformations is enhanced over a wide range of domains like knowing, thinking, investigating, problem solving, representing, sharing, synthesizing and collaborating.

In classrooms, mapping for conceptual change thus, typically involves a series of formal transformational thoughts and tasks for intellectual growth over a continuum from analyzing to synthesizing. In a relatively shorter span of time, misconceptions are overtaken by acquisition and induction of new knowledge by concept maps usage in Geographic pedagogy. These maps can be used to tailor lessons to the immediate curiosity and interest of students, resulting in a richer content and a more meaningful science learning experience in Geographic studies. Students shall bear an opportunity to evaluate and restructure their evolving understanding of science in the Earth’s geospheres. In Geographic pedagogy, successful mapping for conceptual change focusses

upon unfolding of expert knowledge and the skills a teacher has towards designing content and learning sequences. This teaching instructional process of mapping encourages discussion of knowledge and reflections of transformations in scientific, educational and professional acquaintances and experiences (Åhlberg, 2013; Rodríguez et al., 2009; Stoica et al., 2011).

Conclusion

Learning spatial science (Geography) by design pedagogy fosters higher order thinking skills and deeper learning. It creates deep impression in youngster’s mind and leads to meaningful learning rather than superficial rote learning. We have many different pedagogical approaches to teach Geography like Experiential learning, Collaborative learning, Problem solving and so on, among which Concept Mapping is one of the important strategies to add. By using concept mapping, Geography teachers can give conceptual ideas to learners for better clarification of concepts with sound bases and more empiricism in knowledge. Also, it makes learning creative, and emphasizes learning by doing, when teacher being a facilitator only in classrooms. Students are engaged in constructing their own knowledge. This concept mapping strategy acts also as a tool of assessment since during whole pedagogical process, students are asked to draw the concept maps twice a time, once in the beginning to check the level of previous learning, and next at the end, to assess the linkage of old learning and newly learned concepts. Thus, concept mapping enunciates upon the relationship between the contents and sub-topics of Geographic nature, and offers space for individual learner to learn at his own pace. It assists in brain storming of young developing mind, sharpens the mental ability to refine the knowledge with more insights and meaning for what one learns in a lecture hall. It describes the ability of learners to think critically and creatively. While dealing with construction of concept maps, the central topic is identified first, then a list of ideas is brainstormed and noted at. Thereafter, the whole information is organized as a concept in visual form. And the last step is to link those concepts with arrows in correct direction reflecting bonding, association and relationships existing among them

to get a meaningful proposition. Concept maps has found a greater utility in learning and instructions. It is easier to take notes in class whilst live lecture via online or offline mode. Hence it is a versatile tool to develop note taking skills among students offering a broader perspective towards learning and understanding. This drawn visual art is assessed for change in learning levels of pupils.

Evidently, it is very handy to use concept-mapping strategy in teaching learning processes associated with Geographic literature as the resources are freely available. One can make use of these at any time. It can be constructed easily through Paper-Pencil, or by using Cards. Moreover, various free open-source applications are available which provides online platforms for constructing maps in any form or design as one wishes for. It could be in chain form, or in spokes form or can be a network like structure, depending upon ones' imagination and spatial thinking relevant to any Geographic phenomenon. It can be used from kindergarten to higher levels through schools and colleges, i.e. this shall be conveniently applied in any grade and also effectively chosen for any content say it is reading a story, or any article or during practice session when students are asked to recollect the learned concepts. It can also be utilized even in a concluding and closing session to revise the whole content lastly. Similarly, it can be further useful before starting for a new unit to assess the prior knowledge of the pupil gained in past sessions.

In compendium, it is a better assessment tool to evaluate their understanding in concerned topic and to gain insights of their experiences attained through this strategy. Geographic knowledge bearing a complex process or a problem inflicting strict scientific inquiry can be comprehended and commanded through these concept maps. Therefore, an evident impact upon learning process, retention of the content, and formation of theoretical foundation in intrigued and developing minds is assured for the Geographic world.

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