INTERNATIONAL JOURNAL OF

INNOVATIONS IN APPLIED SCIENCE

AND ENGINEERING

e-ISSN: 2454-9258; p-ISSN: 2454-809X

Learning & Teaching of Mathematics Using Concept Mapping: A Technical Review

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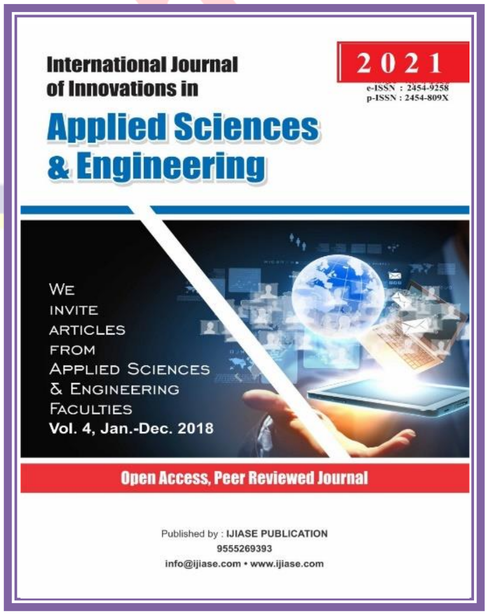
Paper Received: 10th March 2021; **Paper Accepted:** 20th April 2021;

Paper Published: 23rd May 2021

How to cite the article:

Naresh Kumar Seni, Dr. Jaya Kushwah, Learning & Teaching of Mathematics using Concept Mapping: A Technical Review, IJIASE, January-December 2021, Vol 7; 99-116



ABSTRACT

The current thesis was performed with the aim of examining how students and teachers in Learning and Teaching of Mathematics using Concept Mapping use it. Experienced professors are often faced with the challenge of presenting courses or content in a way that students understand and enjoy by hands-on instruction. A compromise may be to reduce the amount of instructional material. Unquestionably, changes are needed, not so much in terms of content as in terms of presentation. A description map is a diagram that shows how definitions are related to one another. It is a graphical platform for organizing and visualizing section or theme material. The phrases (concepts) are often written in "balloons," with lines and, if possible, words defining their relationship connecting them. Describe an experiment in which two groups of students were given different directions for creating conceptual maps in this paper. The experiment revealed that concept maps had a broad range of mathematical applications.

Keywords: *Concept mapping, learning, teaching, Mathematics, knowledge.*

INTRODUCTION

To be active citizens in the twenty-first century, students today need both cognitive and practical experiences during their mathematics education. origins of this statement can be traced back to John Dewey's writings, which stressed thevalue of educational activities such as "the creation of any kind of creative skill, of special scientific ability, of successful citizenship, as well as technical and business occupations"[1]. Based on his studies of incorporating learning experiences of tertiary students in disciplines relevant to nursing and similar services in support of human health, Billet recently proposed that "it could be possible to fully incorporate practice-based experiences into the entirety of higher education experiences that are generative of developing comprehensive and critical occupational knowledge." The key point of this paper is that action learning is the process of imparting these interactions in combination with idea encouragement while teaching mathematics across the entire K-20 curriculum. In the sense of mathematics education, this paper supports the concept of learning by experience to some degree [2]. Arguments for the importance of action learning for all people participating (at the college level, adding a third group or university no mathematics specialist to the duo of student and mathematics instructor) are made. Integration of computer-assisted signature pedagogy (CASP) and non-digital technologies, as well as successful questioning of action learning, are also taken into account. Students may enjoy formal mathematics education for twenty years or longer, and they can be inspired anywhere in the vast mathematics curriculum. Mathematical subjects are brought to life by action learning and rote theory of mathematics education. Primary-level instances are, of course, foundational, and this is strengthenedby secondary-level intervention learning. Mathematics open problems are often applied to students in elementary, secondary, and tertiary education. Classic outcomes and open questions have historically helped to inspire not only students but also educators. Activity learning should be encouraged at all stages of mathematics education because successful mathematics teachers are required, and potential instructors are within the current student population. Certainly, the prospect of participating in research is extremely motivating to all, including students and mathematics teachers.

A definition map is a diagram that shows how concepts are related to one another. It is a graphical tool that can be used to arrange and, more importantly, visualize section or theme information. The terms (concepts) are frequently written in "balloons," and they are connected by lines and, if necessary, words that define their relationship. There are a few graphical displays that tend to be identical at first glance but vary in their approach, features, and application. Mind maps are the most similar of the three, but they have a distinct function. They aid recall and can be used as an extremely useful instrument in brainstorming. Mind maps are arrays of terms arranged by the author's mental meaning, using graphic mnemonics, color, symbols, and visual connections. Also, an algorithm can appear to be a design mapat first glance. The term "algorithm" refers to a step-by-step method for performing calculations. We use special notation and symbols to build algorithm schemes.

The composition of idea maps is hierarchical. Mapping is an innovative method of arranging content that can be used in section planning, studying, person and group work, mathematical literacy growth, and mathematical thought. Other school topics and daily life will benefit from conceptual mapping. Once accepted, making concept maps becomes the way of successful learning. The conceptual mapping technique was introduced in education.

Concept maps are visual representations of information that are used to coordinate and represent it. Concept maps are a new way of thinking that has yet to find a home in the classroom. Many research papers on the use of concept maps in information assessment have recently been published. We assume that since the form of assessment is seldom

used, teachers should be allowed to use these procedures to innovate in the classroom. In this paper, we discuss concept maps and how they can be used in mathematics teaching, learning, and knowledge assessment.

CONCEPT MAPPING

It's a graphical tool for arranging and visualizing section or theme content. The phrases (models) are often written in "inflatables," with lines and, if possible, words linking them to define their connection. In this paper, explain a studyin which two groups of students were given separate directions for constructing conceptual maps. Concept maps were discovered to have a wide variety of mathematical uses in the experiment.

Cross-links are a crucial feature of idea maps. On the diagram, there are connections between ideas in various segments or domains of information. Cross-links assist us in deciding how these domains are linked. Cross-links oftenreflect imaginative leaps on the part of the information creator when creating new knowledge. Concept maps are distinguished by their hierarchical representation of concepts, along with the most interested and broad concepts on the top of the map and unique, less general ideas at the bottom side.

We decided to equate the outcomes of the study of the maps using the scoring measures proposed by Novak [3] and Gowin with the results of the standard battery of course evaluations using multiple choice and expanded questions since concept maps seem to be gaining prominence as possible evaluation instruments. To be honest, these scholars were not excited about maps being used for evaluation purposes and only viewed them as learning aids. Many consistent and validly connected nodes gave rise to simple layers that were logically built-in ‘good' maps. Maps with few nodes, limited linkages, and indistinct layering are graded as ‘poor.' Our 546 maps were divided into three piles asa result of this research. There were many that obviously fell into the two extremes mentioned above, but about a third ended up in the center, such as those with several nodes but a messy interface. While it was difficult to calculate a precise association between the map ‘scores and the standard evaluation scores, the following trend appeared.

to construct algorithm schemes.

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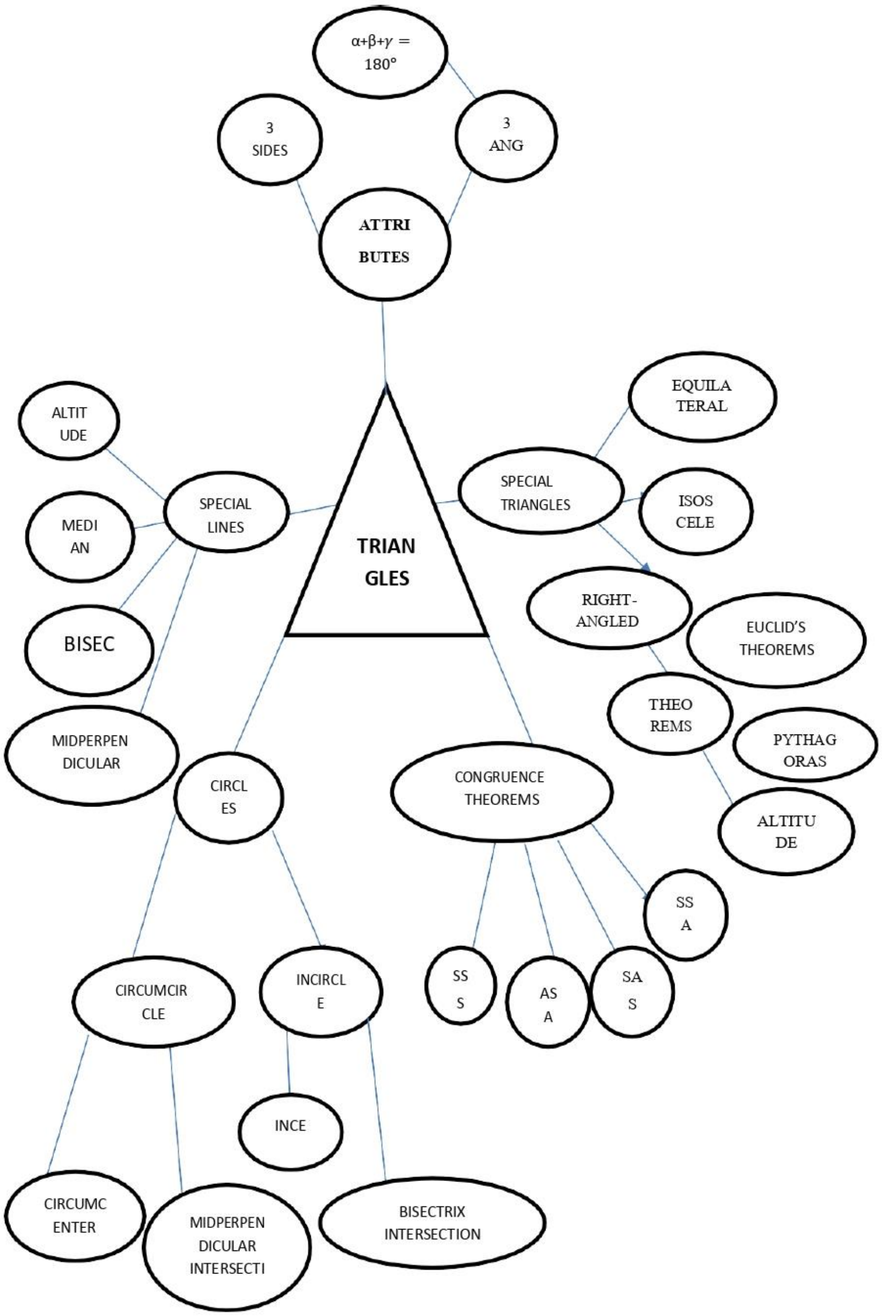
(i) I Students with maps in the ‘good' and ‘intermediate' grades seemed to fall into the middle two quartiles of the standard evaluation score distribution. This is unsurprising given that the party accounted for 75% of the class and their distribution would be considered "natural."

(ii) Students with ‘poor' maps, on the other hand, were nearly evenly distributed between the first and fourth quartiles of the usual evaluation score distribution.

A definition map is a diagram that shows how concepts are related to one another. It is a graphical instrument that can be used to arrange and, more specifically, envision section or theme content. The terms (models) are frequently written in "inflatables," and they are connected by lines and, if necessary, words that define their relationship. There are a few graphical presentations that seem to be identical at first glance but vary in their approach, features, and application. Mind maps are the most similar of the three, but they have different functions. They aid recall and can be used as an extremely useful instrument in brainstorming. Mind maps are arrays of terms organized by the author's mental meaning, using graphic mnemonics, color, symbols, and visual connections. Also, an algorithm can appear to be a design map at first glance. The term "algorithm" refers to a step-by-step method for performing calculations. We use special notation and symbols earning until it is embraced. Joseph Donald Novak **Error! Bookmark not defined.** pioneered the concept mapping methodology in education.

Figure 1. Decision-making process using data analytics



UTILIZING OF CONCEPT MAPS

Concept maps are utilized in learning to incorporate new concepts, connect previous and new understanding, analyses knowledge, and coordinate knowledge.

Table 1 contains answers to questions about idea maps given by 9–10-year-old Italian students.

Table 1: What do kids make about idea maps?

What is a map?	It's a plan in which I research and think about a subject. It's a good system to research in a linear order. It is a synthetic scheme structured in the same way as our thoughts are, with each subject connected to the next. It is a formal method of studying that helps me to talk fluently about a subject. It's a diagram that depicts the functions and details of... everything. It's a simple diagram in which I organize the most interesting aspects of a subject. It's equivalent to a diagram that illustrates the main word. It's a synopsis of a book page. It's a method in which I jot down the most important things. It's a well-organized and written plan. It's a schedule that I can look at and see what's important.
What do you do when building a map?	I'm on the lookout for terms and data. I assign each point a sense, a phrase. I arranged the terms in a logical sequence. *What precisely do you expect when you say, "putting things in order"?* • o I positioned them correctly. • o I categorize them. • o the most important is at the top of the chart. I draw my map with a pencil or a post-it note. I used arrows and connecting phrases to connect the sentences. By rearranging arrows and connecting sentences, I can rearrange the order of the sentences.
What is its use for?	It aids me in recalling what I've learned: the scheme is imprinted in my memory. It assists me in deeper interpreting a definition and conveying meaning. It assists me in learning, speaking, and comprehending. Getting a well-organized, rational graphic scheme is helpful to me. It allows me to learn more easily and quickly. It allows me to go through what I don't know and make connections with various subjects. It allows me to understand a great deal from merely reading summaries.

CONCEPT MAPS FOR INSTRUCTIONAL MODEL

The Domestic Science Teachers Association sponsored the efforts of a National Program Committee in the early 1960s to assist schools in planning science programs for classes K-12. A forum of technologists and science educators was held by the Committee to define "big philosophical schemes" that could be used to direct curriculum creation [4]. Despite a surge in interest in the ideas put forward, it would be impossible to pinpoint major improvements as a resultof the NSTA's work or the various publicly financed science education programs of the 1960s. According to current opinion, American science instruction covers behind schedule that of the world's most scientifically advanced nations. One explanation, I think, that the NSTA program initiative had fewer successes than expected was that it was difficult to explain how a curriculum based on science's "big philosophical schemes" would vary from what was already in operation. I assume that concept mapping is a solution to this issue. As points out in his initial paper, idea charts can be used to provide both an international vision of a K–12 science program based around fundamental science concepts and differing degrees of “magnification” to the level of a single science section, with each map showcasing core concepts and concept interactions needed to grasp the broader or more concrete realm of science. As he points out, the domain under analysis may be “telescoped” from a function to a minuscule definition map.

As previously mentioned, the majority of preservice and in-service teachers with whom we have worked see science as a broad body of information to be learned rather than a tool for creating new knowledge about the cosmos. Helping educators and their teachers see science as an emerging system of concepts and concept relationships, as well as a technique for creating (rather than learning) new concepts and concept relationships, remains a major challenge. There are basic epistemological issues to be answered, as well as fundamental psychological issues to be addressed. Solving these questions will be complicated. In their paper for this special issue of JRST, Stm and Krajcik look at some of the applications of concept maps as a heuristic for Cumulus development. A series of model maps was createdover the course of six three-and-a-half-hour sessions with teachers in grades four through eight. They discovered majorimprovements in the maps that the teachers produced, with more foundation superior thoughts and greater detail, explicitness, and incorporation of concepts. They come to the conclusion that using idea maps for these teachers shifted their perspective on education, which has significant consequences for teaching and learning. Fisher's paper inthis topic outlines the work she and her collaborators have been undertaking to create a modern model of information representation method that is computer-based. The SemNet”' is a network of scientists who work together to solve problems.

program takes advantage of the Macintosh computer's ability to store and access data in a number of ways, allowing for the storing of basic ideas and idea relationships in a variety of patterns. The SemNet“' show, on the other hand, does not allow for the printing of anything resembling a design diagram. Fisher and her collaborators used a cut-and-paste tool that they considered helpful for curriculum preparation to create these. The authors of Biological Science: A Molecular Approach, a new BSCS (1990) Blue Form high school science paper, using concept charts for both preparing and writing the novel. Despite receiving only rudimentary training in idea mapping, the majority of paper writers created strong maps to reflect the information structure of their paper. Furthermore, the interrelationshipsbetween topics in different paper is pretty plain to see. In the Teacher's Edition of the published version, there is a section that briefly outlines definition mapping and includes sample maps for each paper. Other recently released science textbooks contain related material.

The development of programmes that make science “theoretically clear” for both teachers and students will assist in the resolution of a widely debated issue: the majority of our population's “scientific illiteracy.” Wandersee and Good, for illustration, co-teach a graduate course called "Science Literacy and Practical Learning," which emphasises this association. Lloyd's essay on this subject address both scientific illiteracy and another concern. Textbooks are used in many science schools, and textbooks written for the least capable students contain the least amount of intellectual elaboration. Most reading comprehension tests, on the other hand, indicate that texts with more elaboration of given ideas are more comprehensible, particularly for novices, than texts with less elaboration. Lloyd covers a variety of reading comprehension subjects as well as some critical research. Lloyd selected photosynthesis as his topic and compared the degree of elaboration of the concept in three separate textbooks aimed at three different student populations. Lloyd found the least elaboration of photosynthesis in the textbook for the least qualified group of students, who used definition maps to represent the principles and relationships in each textbook. She thinks that it's impossible to allow these students to understand the biological process photosynthesis. In more "advanced" textbooks, she still noticed major variations, but her charts showed that they, too, had defects of exposure clarity. Further research, such as Lloyd's, and studies that compare student success with various grades of textbook elaboration are essential. A study involving two or three student classes and a more definite approach may be given in the two or three textbook passages issue of whether clearer elaboration of definitions in textbooks will boost our graduates' science literacy.

CONCEPT MAPPING FOR MATHEMATICS TEACHING PROCESS

Some scholars have highlighted significant facets of fundamental thinking procedures in the form of mathematics learning and teaching. Usabiaga [5], Fernandez, and Cerezuela (1984) [6], for example, state that the interchange of inductive and deductive procedures will assist students in developing complementary ways of behaving, and that this interchange enables students to access mental elements and imaginative tools to solve problems. In terms of the introduction-tax deduction relationship, the author argues that it is not acceptable to remove inductive components from a student's cognitive behavior in the classroom so quickly. In the one hand, it is wrong to assimilate the empirical method in a simplistic fashion, that is, to either use the deductive component or the theoretical-rational method. The lack of inductive procedures (abuse of empirical procedures) restricts the forms of individual study that are necessary for thought growth. That isn't to say that as a pupil progresses through the standardized stages, he abandons deductive reasoning. In order to reach high levels of abstraction, the student must depend on previous training in inductive systems, according to his personal experience. This implies that when studying mathematics, inductive and deductive methods should be balanced. This balance must be found when developing didactic methods, without slipping into either an inductive or a rational extreme. Although insistence on the theories, it is necessary to note that a important aspect in the moral methods to be developed, from the perspective of Science Research, for the education of mathematics, the teaching task involves promoting an inductive mechanism by evaluating the contents and illustrating the reality, illustrations, and experiences, which are available to the students' intelligence, to be interpreted by the students. The teacher in command will lead the students into conceptualization, without ignoring the mechanisms of interpretation and with visual assistance (De Guzmán, 1996) [7], beginning from their understanding of this knowledge. To encourage the deductive method, the instructor will direct the students so that they arrive at facts and examples, which are understandable, by beginning with definitions (i.e., generalities) and using pictures. The teacher's definition maps are a valuable reference for this type of teaching assignment.

This approach, as a moral or learning technique, is applicable not only to mathematics or physics, but it was also the method from Whose thinkers and scientists, including Aristotle, Galileo and Newton, gained experience. It's a way of expressing the manner in which such information was created. Mathematical knowledge is not without its own set of teaching techniques. The moralistic of mathematics is a little latent in its own construction, as González [8] and Dez (2004) [9] point out. The path that brought the scientist to knowledge was also the path he took to study.

In the field of daily education, approaches that largely obey deductive mechanisms are very popular. The student is not taken through an inductive method first before being taken through a deductive process. A formal philosophical structure is generally implemented by emblems that include concepts, descriptions, theorems, and regulations; that is, they incorporate philosophy. This is especially true in master classes, which are popular in university lecture halls. When the pupil is unable to grasp such a scheme, audiovisual techniques are used to assist comprehension. They want to move from a theoretical context to representation. When they know the student is unable to apply the concepts, except with the help of audiovisual techniques, they show him how to apply the concepts. As a result, they eventually arrive at the fact (the particular) from which they should have begun. As a consequence, in both classical and contemporary education, the order of learning tasks is neglected. Quality learning necessitates training that strikes a sense of balance among the thought procedures that conform to concept.

ESSENTIAL METHODS AND THE LEARNING OF MATHEMATICS

The design maps that follow are a series of them. They were chosen with the goal of further explaining the subject as a reference for the instructor throughout the teaching process. Their traits will be discussed, as well as the various forms in which they can be used in the lecture hall, to demonstrate their ability to aid in the creation of thought processes. Teachers who like to use these concepts in their classes should make their own modifications for the critical and comprehensive role of teaching based on their own experiences.

The idea diagram A function's critical point serves as a model for the teacher in providing data that progresses from the specific to the common, fostering an inductive process. The data in this map relates to the derivative's applications, which is an especially important topic for resolving problems in real-world engineering. The teacher will demonstrate each of these examples by using derivative-related mathematical methods to determine the value of the key points and then identify them. To illustrate the various forms, a large battery of functions with essential points can be seen, leading to a more general definition. Different functions can display maximum and low points as extreme values, while some can only display non-extreme values. All of this will combine to form key points in a function. Itis beneficial for the student to remember the characteristics of each crucial stage. This will aid him in completing a portion of a feature analysis which will be particularly valuable knowledge for generating a graph. The deductive method happens as previously understood definitions are compared to evidence (information derived from a function analysis) in order to arrive at the crucial points of a function and its organization. To put it another way, after the student has agreed.

He will categorise the critical points into thrilling and non-risky values. If extreme ideals are involved, he will divide them into maximum and low points. He may distinguish non-extreme values in points with a vertical tangent line or a parallel tangent line if it is a matter of non-extreme values. Differing facts with beliefs and concepts with facts, according to one understanding of Piaget's thoughts, contributes to inductive and deductive methods, which contribute to productive learning [10].

It's value noting that the concept of the derivative may have been assimilated prior to studying key points of a function. It is particularly important to emphasise that, from this viewpoint, teaching mathematics does not simply entail providing pupils with a definition map created by the instructor. They are just the teacher's own belongings. If the teacher so chooses, these maps could be displayed at the end of class. It is also beneficial for understanding and reinforcing cognitive growth as students attempt to make their own maps with the help of the instructor. This practise, which can be performed in groups, necessitates special sessions during a course where collective work is done, resulting in essential affective elements for the pupil in the learning environment in the classroom, among other things. Any of the above principles can be outlined as follows: learning arises in the dynamics of teamwork through experiences in the social framework of the teaching space.

REVIEW OF LITERATURE

Two viewpoints on schooling are illustrated by Hernandez et al. (2005) [11]. Marton and Saljo (1976a [12], 1976b [13]) were the first to change the rapports bottomless effort and shallow focus in knowledge to describe the two distinct forms of processing information, he claims. In general, deep concentration requires the student to focus his attention on the substance of the learning material and to be oriented toward the message, or purpose, contained within it. The student's superficial emphasis is defined by the fact that he focuses his attention to the text itself, toward the symbol, indicating a reproductive learning conception. Understanding is important in deep focus, and memorization is important in shallow focus. The primordial ideal in terms of classroom methodology, according to Hernandez et al. (2005) [14], is not to attempt to modify the subject (i.e., student) in order to increase understanding. It is rather to alter his learning knowledge or idea of learning. The use of idea maps as a teaching aid leads the latest encounters toward a deeper level of learning. During the learning process, nonintellectual components are changed. The development of these components necessitates the development of both motivational and affective influences. Expectations, aspirations, desires, and behaviors are also motivational influences. The formation of affective factors includes the development of a sense of wellbeing, freedom, and the development of one's own self-concept (auto-concept). The auto-concept is the representation of the subject that he or she has of himself. The auto-concept is formed by a varietyof influences, including learning experiences. It's important to remember that in the classroom or lecture hall, taking into account emotional and cognitive circumstances promotes a learning environment and engagement in problem-solving, which shows in students' cognitive and non-cognitive skills, as well as their self-concept. According to Polya[15], it would be a fallacy to think that solving a dilemma is solely an analytical exercise; commitment and feelings play a significant role. Auto-concept is a fundamental aspect of learning that can be changed or built in the classroom, resulting in improved learning. Collaborative exercises in the classroom for the development of idea diagrams have a significant impact on students' motivational and affective influences. Teachers have a big job in the classroom to teach students how to manage negative emotions like anxiety, terror, despair, and perplexity, which stifle cognitive processes. The potential of a student for awareness, power, and gestation of emotions can be understood as forming auto-concept. Anxiety and despair will occur during a time of cognitive conflict, leaving the student with two choices:management of his emotions or dropping the task or operation. Any initiative directed at bettering learning processesis a step toward ensuring educational equality. New research into the learning and teaching processes is required in the university domain. Students, instructor quality, and technologies are all factors in pedagogical information research. Mathematics instructors at Mexico City's Universidad Autónoma Metropolitana are currently working on amathematics site on the Internet called "CANEK,". Concept maps are being formed and will soon be integrated with web content. Theory and problems are currently available on the learning care page; in the future, it is hoped that all of this online content, as well as its idea charts, will serve as a component for more instructional study, adding to pedagogical expertise in the field of information technology. Any critical issues must be discussed, according to Román and Dez (1999) [16], such as how the pupil learns, how the teacher teaches, and what the classroom setting, and life are like. From this standpoint, the writers stress that all paradigms should and should be supplemented. Individualism is emphasised in the cognitive context, while socialisation is emphasized in the socio-cultural paradigm. The first is concerned with the individual, including teacher and student thinking processes, while the second is concerned with the situation-set-individual relationship and vice versa. Following these principles, learning mathematics can be viewed as the growth of capabilities and attitudes. Concept maps, as is well known, are an important teaching method for assisting in the learning of various contents. However, it is important to remember that this, in turn, entails initiating thought processes that promote the development of a cognitive structure and, dependingon how the teaching activities are organised, a significant opportunity for the development of affective aspects in the context of collaborative learning.

Reasons for using idea maps in the learning and teaching process can be found in a variety of curricula styles embedded in various instructional paradigms. However, by examining educational landscapes in various parts of the world, we can uncover additional compelling explanations to investigate and implement innovative teaching methodologies such as idea maps. In today's "society of intelligence" or "society of learning," the production of cognitive and affective components, also recognized as the expansion of ability, has risen to the top of educational systems in many countries, from elementary school to university.

The mechanism of consensus in the European Area of Higher Tutoring and the

be increasingly adapted to society's ever-changing needs and demands. The relentless transformations in society prompt organizations to consider their position, dedication, and, most importantly, how to respond to society's new needs and demands. In the case of educational institutions, contemplation in the pedagogical environment is critical in order to be able to listen to and have better pupil formation in accordance with the context's characteristics. The common features of today's cultures in almost all countries compel reflection and debate about the position of universities and growth of competency is important to note [17]. In the Europe of Expertise, universities play a part a particularly significant part in social and human progress. Universities have the responsibility of providing people with the requisite skills to meet the demands of thenew period, as well as causative to the consolidation and enrichment of European citizens. The Sorbonne Declaration of 1988 [18] emphasises the central role of universities in the growth of European cultural aspects and the establishment of the European Region of Higher Education to facilitate citizen mobility and job opportunities for the continent's overall development. All nations' higher education and academic structures, not just those in Europe, must

their contribution to society. | Similarly, to talk about improvements to help student formation now, careful attention must be given to the method of studying and teaching in order to establish forms of behaving in the classroom that is distinct from the normal or classical ones. In other words, it is important not to ignore the value of didactics when carrying out actions in the classrooms in order to speed up the student's thinking activity, helping himto improve his thinking capacity, which in turn motivates him to learn. It is a question of achieving meta-cognitive autonomy in the student in order to promote his integration in a modern social context characterized by facts, awareness, and a wide range of activities. When one evaluates educational institutions at all ages, from elementary to university, one can consider and discern complicated circumstances. There are currently issues with the teaching and learning of mathematics all around the world. Certainly, this fact of education has piqued people's interest in learning about research that has an alternative or roadmap for teaching and learning this material from various perspectives. Mathematics is important in many respects, including its uses in research, technology, and even everyday life, but it also has tremendous educational importance at all levels because it allows for the creation of thinking. Improvements that mean new approaches (approaches to teaching and expertise focused on the development of competence) that allow people to engage in society's activities are improvements or transformations that aim to a large degree at social justice as well as enhancing higher education, as numerous thinkers such have pointed out. In terms of universities' social engagement, there are significant facets in the proposals (for the growth of competence) that are essential for students' learning, taking into account the cognitive and affective dimensions of the learner. Casassus (2003) [19] states that variables within educational institutions (internal variables) bear more weight than variables outside the institutions (external variables), such as communities, social milieu, and what this entails, for example, our students' previous academic creation. Within the university, the variable "teaching without respect for learning," that is, teaching without regard for the production of competencies, encourages those external variables to join play, resulting in dropouts or regression in education. Whatever approach makes the mathematics learning process simpler is important for its future contribution to skill growth and all that it entails. Much of the work for proper student formation continues in the classroom, with various forms of behaving by teachers, as well as reflection on behaviors and existing didactic tools. This paper suggests that idea maps are a didactic tool that aids in high-quality learning, which is described as learning that is positive, substantive, and based on experimentation. Quality learning, according to the socio-cognitive model, is described as the production of cognition and affectivity.

CONCLUSION

It's becoming more difficult to discover new approaches to teaching and teacher instruction. Different approaches to knowledge representation and transfer, as well as the assessment and appraisal of learning and teaching methods, are gaining momentum. Teachers and students will use mental maps and mind maps to lay a clear base for realistic and long-term learning in order to develop comprehension, talents, and abilities. Individuals' cognitive and metacognitive skills can be enhanced by using logical maps in a structured way.

New methods to teaching and teacher training are getting further difficult to come by. Different approaches to representation and information sharing, as well as measurement and appraisal of learning and teaching systems, are becoming more common. Teachers and students will use mental maps and mind maps to create a strong base for successful and long-term learning with the intention of enhancing awareness, skills, and abilities. Individuals' cognitive as well as metacognitive competencies can be established by structured use of mental charts.

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