Cognitive Erudition plus 'Three Level' thinking bolstering Education

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Abstract – **Education in modern world faces the challenge of ever-increasing volume of knowledge. Knowledge faces an explosion with internet resources discharge with ease of access to new researches and discoveries. The student society rather the learners are poised to face the discomfort id consolidating this bulk of knowledge. Cognitive science equipping us with tools and methodologies of modern learning help conquering such a challenge. This paper proposes a solidified cognitive methodology to improve classroom experience using lateral approach. The viewpoint we try to define is from the learner as well as trainer's side, as identified crucially under the principles defined by DALE CARNEGIE'S in his principles to be an effective and virtuous trainer. Cognitive science is vast and has various intricate angles one which we try to bring focus upon is 'Problem Based Learning', which has been explored widely for logic building. Work proposed here is based on the brain structuring which is identified in its virtual functional capability. The essence of proposed method is to endow a learner with realization of vast mental capabilities to endure volumes of knowledge and stay abreast. Standards specified here require fundamental knowledge of surrounding environment. Applications of such method may also help in mining techniques for smarter educating methodologies.**

Key words: idea generation; lateral thinking, thought process; learning, reversal, absence;

I. INTRODUCTION

Cognitive science [1][2] is famous for dealing with the way one perceives the world. Cognition involves collection of empirical data and a conclusion over it to satisfy an end need. It arises not only out of basic need but also from the fact that brain's subconscious intrigues mind to keep consciousness busy to prevent it from the realization of various biological processes like respiration, digestion, etc. going on simultaneously. This approach is basic to development of mind maps, which play major role in selection rejection, or expression of new ideas.

Education is a process of assignment of necessary tools to the subject (over here human beings), to express their thoughts and perception. It also inculcates brain with fringe capabilities of inference, mimic, solve, derive, etc. Various approaches been adopted to impart rational knowledge. Conditioning again a radical approach adopted to teach and impart knowledge. Education conveys which involves phenomenal work when it comes to dealing with the philosophy, thinking, values, beliefs and way of life. In upcoming sections we shall look forward to a structured cognition to be imparted to vassal, abstractly shown in figure 1.

Learning[1] is a progression on human intelligence and the trained network specifically biological neural network present inside the human brain [3]. Logical selections and reasoning are the two firm bases in the trained networks [3]. These networks follow supervised and unsupervised approaches to make selection a more definite and defined process. The learning rules are obtained from theoretical theories and practical experiences are accumulated over the time. The experience may be unique but may form one of the effective parts in making the network learn and act synchronized with human actions.

Figure1. Cognition abstraction
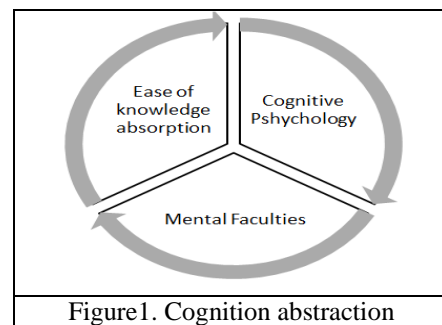
In this paper, we consider ideas as the images, which are selected by the neural network. These are those images, which are finally expressed and are visible or audible to normal human senses. These images are some of the images from a huge set of images with all possible combinations of the elemental input. Study of lateral tactics is to highlight their significance in the contemporary realm.

II. PRINCIPLE

The Domain of idea[3] generation is an infinite set but the constraints to the domain are limited and easily identified. Now these constraints [4] (Input Factors to the Brain) may be-
- o Knowledge
- o Culture
  - o Surrounding Environment
- o Luxury provided/felt
- o Psychological Stability
- o Creativity
  - o Imagination Quotient
  - o Artistic Ability

This Domain influenced by the effect factors such as
- o Need
- o Stress
- o Urgency
- o Focus and Clarity
- o Expression

The effect factors speed up idea generation as the factors come together in effect and distort when let apart. If we consider brain to be a machine present in our body, then provision of similar input and input conditions shall lead to same output let be different vassal. Vassal here is in specific to human beings who genetically share 97% similarity. Thus, using such approaches may improve absorption and understanding of newer concepts and previously discovered theories. In follow up we see details of lateral thinking and its various tools.

III. LATERAL THINKING

According to Dr. Edward De Bono, the concepts of Lateral thinking [8] and Vertical thinking relate to new Idea generation and selecting what is Relevant respectively.

Lateral thinking:

- o Generative thinking where all the possibilities (including cases of failures i.e. voids and negative thoughts or absent patterns i.e. invalid conditions) are considered to be equally present as any positive situation or success.
- o It is through ones trained decision making that one of these possibilities is selected as profitable and effective. Thus, the generated new idea helps to get rid of old.

Tools defined for lateral thinking
- o Insight
- o Creativity
- o Humour

As a tool to generate new ideas, creativity is a way of handling information only; but not a necessity in idea generation. This point supports the fact that machine can generate Ideas. It's an arrangement which is logical when observed carefully. It's an organisation of information in a logical or symmetric form, may be of random generation. It may continuously advance with newer inputs.

We can formulate the way, how mind generates ideas:
- o Mind accepts the information into patterns
- o It is a self-organising and self-maximising system.
- o Culture helps in establishing Ideas. Culture is a set of routines followed, since generation.
- o Education provides with tools to communicate these ideas and habit of learning and collecting facts and information, which is self-sorting to generate new ideas or anchor older ones.

This theory implies an idea as one of the possible combinations put together; say in the form of different images made up of elementary inputs. These images pass through the trained network and a final selection is based on some defined rules. Thus, it is possible to develop such a system in machine where a machine can generate ideas to interact with the user and help him enhance his innovation skills.

We can organize the working of mind (Figure 2) as follows:

Surroundings feed in to the Mind function; they feed the elemental inputs to the brain, which it interprets as patterns of logical setups or random features.

Then it operates on the patters, which undergo the recognition phase where there are two possibilities as follows:
- o To react to the patterns; this can vary on a wider scale of probabilities of the decision making to reaction to be taken towards the pattern.
- o Establish the patterns with use.

These patterns are then more firmly established and stored with the code form. The codes are virtual markers. These markers help in calling up the file, pointing to the data or pattern. Pattern is a more correct word to use here. This pattern is to be read and referred to on need or thought process initiation.
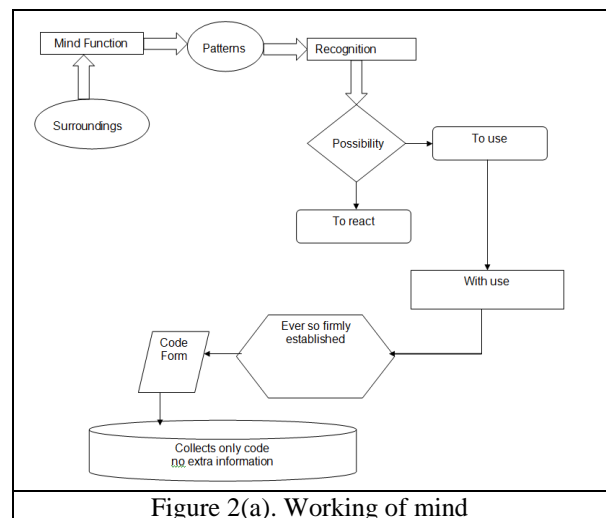

Figure 2(a). Working of mind

IV. PROBLEM BASED LEARNING

Problem-based learning (PBL)[10] is an exciting alternative to traditional classroom learning. With PBL, your teacher presents you with a problem, not lectures, assignments, or exercises. Since you are not handed "content", you're learning becomes active in the sense that you discover and work with content that you determine to be necessary to solve the problem.

In PBL, your teacher acts as facilitator and mentor, rather than a source of "solutions". Problem based learning will provide you with opportunities to examine and try out what you know, discover what you need to learn, develop your people skills for achieving higher performance in teams, improve your communications skills state and defend positions with evidence. Come up with sound argument and become more flexible in processing information. Thus, meeting obligations

practice skills that you will need after your education. Figure 2(b) depicts the necessary activities enveloped under Problem based learning:-

Fig 2(b). Problem Based Learning Activities.
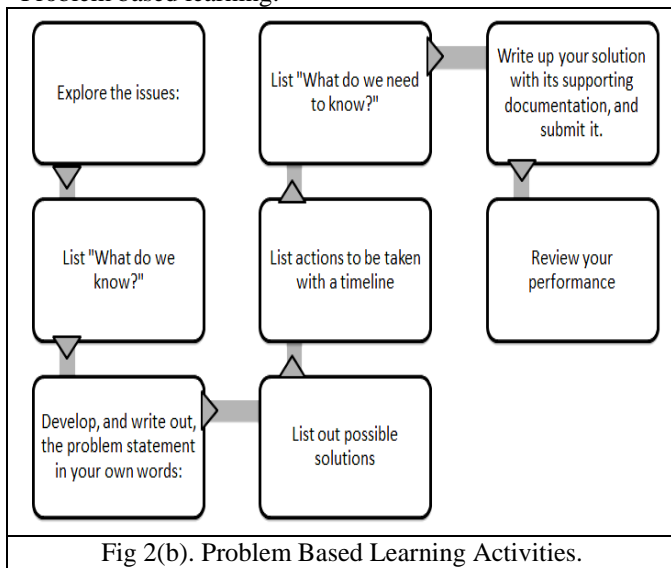
These activities require an ill-structured problem and students who have an edge in structuring these problems and listing issues and obtain solutions for same. Students again may use cognitive methods mentioned in later sections of this paper to improve their efficiencies during this process.

V. ANCHOR AND GHESTALT THEORY

An anchor [6][7] is an object used to attach a ship to the bottom of water at a specific point. The term anchor is also used in fields such as learning, geography and psychology. For example, "anchored instruction" is "situated" learning within the social constructivist paradigm for the purpose of teaching students to understand and solve realistic problems. Anchored instruction is relative to the goal-based scenario model and may resemble problem-based learning. Golledge proposed the "anchor-point theory" based on earlier work by Piaget.

Golledge [6][7] suggested that landmarks can help users overcome egocentric perspectives. Some landmarks are assumed to be required to anchor. The anchor in spatial learning is a critical role for assisting users in building ground for further links. Gestalt[7] psychology is a theory of mind and brain, proposes that the operational principle of the brain is holistic, parallel and analogue with self-organizing tendencies. It emphasizes higher-order cognitive processes in the midst of behaviourism. Gestalt theory applies to all aspects of human learning, although it applies most directly to perception and problem-solving. Wertheimer proposed two modes of human thinking: productive and reproductive. Productive thinking solves a problems through insight; reproductive thinking solves problems by referring to previous experience and what is already known.

VI. DALE CARNEGIE'S DOCTRINES

Learning is crucial to education and education has been popularised under the renowned environment of "Teacher-Student", referred to as the "Guru-Shishya" tradition in the Hindu mythology. The concept is stressed upon celebrated figures like Saint Kabeer, Albert Einstein and many others. This ideology has been reworked and documented by Dale Carnegie[9] in his seven principles, which is as follows:-

- o Become a Friendlier Person
- o Win People to Your Way of Thinking
- o Be a Leader
- o Fundamental Principles for Overcoming Worry
- o Basic Techniques in Analysing Worry
- o Break the Worry Habit Before It Breaks You
- o Cultivate a Mental Attitude that will Bring you Peace and Happiness

Enlisted principles are measures which a trainer must opt to be equipped with appropriate attitude and psychological skills to impart never forgetting knowledge and educating student, indirectly the society with a fervour of joy. The seven principles involve a great deal of mental aptitude i.e. a preparation of the sort to manage and embed daily profile with seven additives stated by Dale Carnegie. The 'Three Level' thinking approach discussed in this paper help in setting up a solid foundation to achieve this desired plan of Dale Carnegie. He also stated some highlights to subdue negative thought, which hinder literacy progress a result of drop of education standards. These highlights are as follows:-

- o The Perfect Way to Conquer Worry
- o Don't Worry about Criticism
- o Prevent Fatigue and Worry and Keep Your Energy and Spirits High

You need to be at your best, at all times, and employing every potential advantage at hand before stepping foot inside the room where you will be training. In upcoming sections, we try to structure approaches to observe Dale Carnegie's best practices in our daily life to improve education guidelines.

VII. STRUCTURING COGNITIVE LEARNING

Cognitive learning[5] defined as the perception based learning to increase an understanding of real world and scientific theories, which are both practical and impractical at same time. Cognition i.e. reasoning is hard to adopt by all vassals. However the procedure to perform such an act is simplistic and gay(happy). Here we mould a state chart and structure to create an ease in adoption of such procedure.
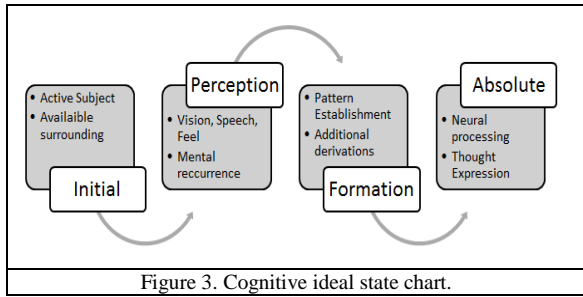
Figure 3. Cognitive ideal state chart.

Figure 3 shows various states that go by in a cognitive approach. Initial state deals with the activation of vassal and availing the surrounding targeted to a specific result for example a chemist would love to be in chemical laboratory, etc. to visualize or experiment his activities. Next is state of perception where input is obtained from surrounding via vision, speech, action and other preceptor senses. Then comes mental weaving of the long pattern wherein the input of previous state is logically organized. Logic followed here may vary from arithmetic to just first in and set out pattern. Long pattern provides input and necessary constrained results to neural processing unit. The neural processors act under various configuration handled subconsciously by vassal's brain. States act in total cohesion. These may be reiterated depending on the users need to perform so. We identify cognitive model as one which involves following building blocks:-

- o Stimulation Entity
- o Percept Compendium
- o Anchor Instruction
  - o Behaviourism
  - o Constraints
- o Neural Processing
  - o Matching
  - o Innovation
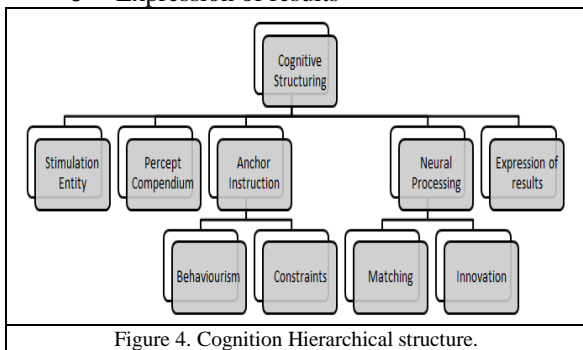- o Expression of results

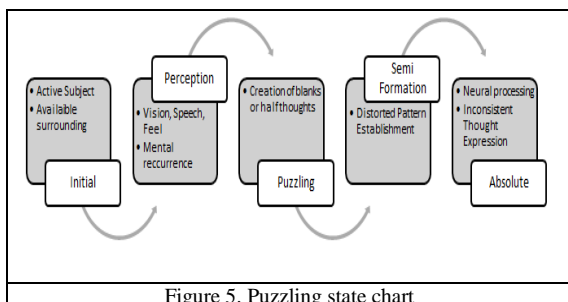Figure 4. Cognition Hierarchical structure.

Figure 5. Puzzling state chart

A vassal needs simulation from surrounding which may be in form of need; spontaneity is an exception path to this step. Collection of percept involves lateral discretion, wherein one collects or records both true and false observations. The necessity of lateral compendium is to make high end possibility consideration possible. The collection of percept is then followed by, a good percept is one where in organised and complete sets are obtained. Half thought are widely known for creation of blanks and creating puzzling states for the brain as seen in figure 5. Now comes an anchor instruction which may be derived from behaviourism and constraints obtained or learned over the time. For example one knows that zeros before one mean nothing i.e. 00001 whereas zeros after one mean a number of high value and significance i.e. 1000. Neural processing is a biological procedure which deal with entities and attributes like threshold, synapse, others. Expression of results is again dependent upon following factors:-

- o Knowledge of language, symbolism literature
- o Resource availability
- o Recording facilities

Above mentioned are three prime factors to which many secondary and tertiary factors may arise. Thus, we complete here on our discussion on cognitive structure.

VIII. THREE LEVELS OF THINKING

In this section a psychological tool is defined give boost to lateral thinking to improve on mental capabilities in the process of:-

- o Decision making
- o Objective identification
- o Task execution
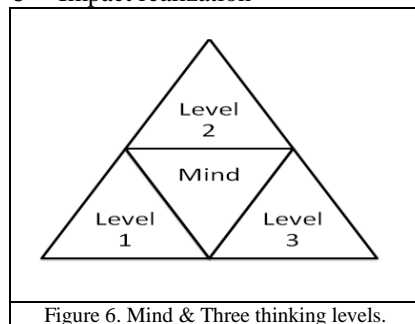- o Impact realization

Figure 6. Mind & Three thinking levels.

Division of these levels has no strict separation boundaries. They are abstract and encapsulate thoughts and their influence over each other. Firstly, 'level 1' which involves having an insight into ones own perception of life. Here vassal is required to fondle with the pattern in mind which deal with one's life as an individual. This realization here shall help in identifying uniqueness of one's choice and necessity to take care of value decision making. Secondly, 'level 2' relative thinking literally one has to consider one's leife in context with others life as well who are close and dear. Consideration of society as part of your own life creates

base template for next level. Last, 'level 3' usually a long transition phase is there to reach over to this level. This level involvers refinement of your choices reflecting on its impact onto your surroundings. Decisions made in this level are optimal and locally achievable for one. They help in creation of complete thoughts for those left blank due to puzzling effect.

Characteristic of Three Levels
- o Unique procedure on self-valuation.
- o Positive and distinct approach.
- o Requires counsel to realize transition from one level to another.

The level approach is good those who go for rigorous brain storming, difficulties in decision-making, drawing optimal inference on known data. The approach be implemented in several ways and may be taught again in distinct fashions. Similarly, styles of approach be implemented as high-end expert system to provide machine learning and intelligent functioning of robots to enhance scope of human activity.

IX. APPROACH IMPLEMENTATION

Due to limited scope of this paper implementation approaches are enlisted as follows:-
- o Thinking styles for brain storming
  - o Absence thinking
  - o Reversal
- o Logging and reflecting on logs
- o Comparative analysis on Conditioning

The approaches are distinct for cognitive learning. Trainer may adopt real time problem statement and prepare simulation environments. Students and trainer should equip themselves with a journal for logging. At any point of time trainer shall be abstract and select a single approach for dialogue. Students shall be quizzed rigorously for the observations they make.

To impart an approach trainer must follow Dale Carnegie's principle's and begin with a friendly discussion. A 'master' i.e. a field expert might be invited for analysing performance and help student in finding an optimal solution. Latency should be handled with care and eliminated by using idle time for imparting mental aptitude. Simulations must always be logged and logs shall be analysed using statistical analysis measures. A detailed plot may be developed by the trainers with novel ideas from his students after every review to progress at an exponential rate.

X. IMPACT DISCUSSION

Cognitive science along with 'Three Levels' shall have a wide impact on education systems. It shall help in inducing interest and class value. Along with cognitive sciences are best to pursue engineering and architecture degrees. Figure 7 here shows class to exam grade comparison where in a professor used cognitive methodologies being imparted to student to make learning effective. One can observe that the average grade is 78.4% which earlier used to be below 70%.
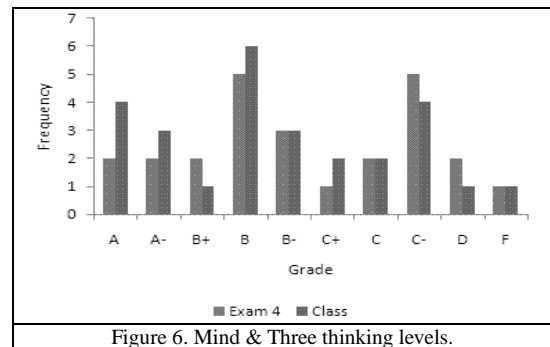

Figure 6. Mind & Three thinking levels.

XI. CONCLUSIONS

This study attempts to propose a process where we re-emulate human thought process. Objective is to generate all possible outcomes, which are valid and stand as equals to each other for user to implement them. System implementation is beneficial for civil engineering, architecture and product design domain. For example constructing flat on a given plot of land. Where all possible outputs are required for optimised ones to be available as an option to the user. Here an cognitive and 'three level' provides with all such outputs covering distinct result on block of the plot.

Dale Carnegie's model is explored and has been subjectively referred to make the cognitive erudition more robust adaption to improve education standards. Problem based learning is mentioned to highlight the wide stream applicability of 'three level' thinking with cognitive erudition. Methodologies discussed are unique in implementation and form necessary tools of modern day classrooms. The speed up the education process and handle volume bulk of knowledge. They provide an evolutionary approach to thought process for lateral thought generation.

I. REFERENCES

[1] Russell Norvig, "Artificial Intelligence," Second Edition, Pearson Prentice Hall.

[2] Thagard, Paul, Cognitive Science, The Stanford Encyclopedia of Philosophy (Fall 2008 Edition), Edward N. Zalta (ed.).

[3] Wertheimer, M., A Source Book of Gestalt Psychology, London, 1923.

[4] Bransford, J., R. Sherwood, T. Hasselbring, C. Kinzer, and S. Williams, Anchored Instruction: Why We Need It and How Technology Can Help. In Nix, D. & Spiro, R. (Eds.). Cognition, Education, & Multimedia: Exploring Ideas in High Technology, Lawrence Erlbaum Associates, Hillsdale, NJ, 1990.

[5] Greg Elvers; Ph.D.,"Cognitive Process Class Rsults",http://academic.udayton.edu/gregelvers/psy321/

[6] Wertheimer, M., Productive Thinking, NY, 1945.

[7] Heng-Li Yang, Cheng-Hwa Lee, "An Idea Generation Supporting System based on Anchor and Gestalt Theories" MIS Dept., National Cheng-Chi University

[8] E. De Bono, "Lateral Thinking," Penguin Publishing House, First Edition, pp 1-32.

[9] Dale Carnegie,"How To Win Friends And Influence People", Introduction by Lowell Thomas, p. 9, copyright 1964.

[10] John Barell, "Problem-Based Learning: An Inquiry Approach", Crowin,a sage company ISBN: 9781412950046