

# Effective Questioning Strategies to aim at Cognitive and Metacognitive Learning English Language Skills for Technical Students of J.N.T.U.Kakinada.

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**Abstract-** Every teacher of English practices asking probing questions in the classroom interaction in five key areas instructional goals like lesson clarity, instructional variety, task orientation, student engagement and student success. Effective questions are the tools students actively respond and engage in the learning process. The purpose of questions getting students interest and attention, diagnosing and checking, recalling specific facts or information, encouraging analysing, generalizing, differentiating, expanding, applying, problem solving skills and synthesizing skills. The technique adopted in the study to apply convergent and divergent questions. The target group is the students of Technical English to develop E.L.T., E.S.P., E.A.P., skills and to empower them. Questioning sets the students brain storming, creates curiosity, interest, challenges the learning to be specific and encourage the English Proficiency in effective and efficient use of L.S.R.W. skills. The methodologies used in this paper are Extending, Extending and Lifting, Funneling, Sowing and Reaping, step-by-step up, step-by-step down, and Nose-divide to optimise the learning English language skills. Cognitive learning is a process of memory, attention, reasoning, problem-solving and decision making. Cognitive learning helps to generate new knowledge. Metacognitive learning is consciousness, self-awareness, social cognition and self-regulation. The main objective of this method to empower the students with English Language Proficiency and mastering the skills for the professional development.

**Index Terms-** Instructional goals. Student engagement. Convergent questioning. Divergent questioning. English Language Teaching. English for Specific Purpose. English for Academic Purpose. Cognitive learning. Metacognitive learning.

**Hypothesis** - Effective questioning creates instructional opportunities for the learners actively engaged in learning to empower successfully living their learning.

## I. INTRODUCTION

The Teaching and Learning process is dynamic and progressive. The target learners are the students, who have completed their Intermediate education, are from rural background, and pursued in vernacular medium. The Jawaharlal

Technical University, Kakinada prescribed two books for Technical English 1. English for Engineers and Technologists by Orient Black Swan, 2.Panorama - a Course on Reading published by Oxford University Press for the First semester and two text books for Second semester 1. English Encounters by Maruthi Publishers, 2.The Great Indian Scientists by Cengage. English for Engineers and Technologists covers six key areas Human Resources, Energy, Transport, Environment and Safety and Training. The material is task-based and skill-oriented to suit the needs Technical Engineers. English Encounters focuses on the key areas Education as The Greatest Resources, A Dilemma - a Layman Looks at Science, Cultural Shock, The Health Threats due to Climate Change, and a biography of Bill Gates. and it has Soft skills section to develop life skills. The book is reader-friendly and activity based aimed at to develop communication skills in systematic manner.

The role of asking questions is crucial in the teaching and learning process by the teacher and the learner. The teacher ensures the learners have the clarity in understanding the basic lesson, variety of instructional strategies used in the classroom interaction, the learners orient their learning to assigned task, the learners engagement in the learning process and the students success. "In the context of a lively and fast-paced exchange in a classroom, questions are important to know what extent the learners learnt the facts, knowledge from the text. Effective questioning involve the students engaged in the learning process. Borich, 2008a: Chuska, 2003: Walsh & Sattes, 2004. The learners and teachers are to engage themselves in questioning is crucial so it should have lion share of classroom 30% - 40% of the instructional time. This will encourage the learners to think, analyze, recall the facts, generalize, differentiate, classify, and apply the facts in real life like situation. Early studies revealed that 70% to 80% questions deal only recalling and only 20% to 30% deal higher order thinking skills. But the recent studies in United States and UK the need for asking higher order thinking skills. Atwood & Wilen, 1991, Brown, 2001: Brown & Wragg, 1993: Wragg, 2001. The teachers need to be trained to ask higher order thinking skills involving analysis, synthesis, and evaluation. Chuska, 2003: Dantonio & Beisenherz, 200; Power & Hubbard, 1999: Wiske, 1997.

The questions are classified into the following categories.

1. Getting interest and attention;

The questions for getting and attention are what is the resources? What are the different kinds of the resources? What is the basic difference between Human resource and natural resource? It is to recall the facts. What do you know about Ramanujan? Who is Ramanujan? Who was his mentor? Where did Ramanujan work before going to UK? Why did Ramanujan return to India? What was Ramanujan's contribution to Mathematics? All these questions demand the factual information about the text. The learners require only memorizing the facts. This is to getting the attention of the learners.

#### 2. Diagnosing and checking:

The Diagnosing and checking questions are Why did Ramanujan write to G.H. Hardy? Why was life in England was not easy for Ramanujan? Why did Ramanujan return to India in 1919? What are the five eligibility requirements for an H-1B Visa? This will stimulate the learners to recall specific facts or information.

#### 3. Encouraging higher-level thought processes;

The Higher-level of thinking skills triggers the thought process. Why do you think Ramanujan is referred to Human Resource? What are the qualities of Ramanujan made him Father of Modern Mathematics? Write a Role-Play the interview between the newspaper reporter and US Immigration Department about the issues of visas by US government. Developing Hybrid Technology to find Green Energy Solutions. Exploring the animal life and Plant life to overcome the handicaps. How are the plants and animals conservation by adoption? These questions probe the learners to analyze, differentiate and synthesize the facts.

#### 4. Structuring and redirecting learning:

Structuring and redirecting learning is to redefine the energy sources, alternative energy sources from seaweeds, Hydrogen-powered economy, Offshore Wind solutions, Solar powered vehicles, Biogas Plants, Wave Power Devices are a few. Making conscious attempt to reduce dependency on Non-renewable sources of energy to renewable Green Energy solutions.

#### 5. Allowing expression of affect:

Allowing expressions of affect in the story of "The Compensation" where Mr. Paterson pays the compensation to the man for his car ran over the pet dog resulting in death of dog. Actually the man was taking his dog to the forest to shoot an end to its suffering. " But now that won't be necessary, since he is dead. In the story lottery by Shirley Jackson where Old man Mr. Warner observing "Lottery isn't fair, it isn't right." resulting the villages killing a person by pelting stones by believing in superstition the killing a person will result in the village prosperity.

The questions in the above categories will shape or set up the learners response. A well formulated questions serve as an advance organizer, providing the framework for the purpose for the response.

## II. METHODOLOGY

The questions can be narrow or broad. They encourage either specific, limited response or a general, expansive response. There are two types of questions 1. Convergent questions 2. Divergent questions.

### 1. CONVERGENT QUESTIONING:

The Convergent questions are otherwise known as direct or closed question. The learner simply recalls certain facts from the previously read text. The learners respond in a limited manner bound by the text. The answers are easily judged right or wrong. Many convergent or closed questions are used in direct instruction. What is a skybus? What is solar cooker? What is solar energy? What is wind energy? What is the pedal energy? What is a Biogas plant? What is environment? Who is Salim Ali? What was the incident made Salim Ali interested in birds?

### 2. THE DIVERGENT QUESTIONING:

The Divergent questioning encourages a general or open response. The divergent questioning is known as indirect question or open question. There can't be one single best answer but it can't have wrong answers. The teacher can expect far more diverse responses from divergent questions. The teacher should be careful to determine appropriate responses from inappropriate responses. In this case the teachers are to provide more detail, more information, or encouragement. The divergent question is rich repository of lively, spontaneous, follow-up material makes teaching fresh and interesting. Ex; How does training help to increase the industrial productivity and economic prosperity? What is office Etiquette? What is the difference between Personal versus Professional Relations? Is it ethically right to use the animals for scientific experiments? What is the difference between Mass production and production by the masses? Compare the skybus with the metro railways? What are the problems of road safety and what are the possible solutions? What are advantages and limitations of the H1-B visa?

Convergent questions can turn into divergent questions when answer to a question demands simple recall. When the teacher introduces a new topic may ask a question for which the learner is not read and the learner guesses the answer through generalization and inductive reasoning. What are the problems faced by the commuters by bus or auto rickshaw?

The Research reveals about Convergent and Divergent questions. classroom researchers have studied the effects on student achievement of asking convergent questions Ceil,1995, Dillon,2004, Gall,1984 The rationales for using higher-level divergent-type questions .The rationales for using higher-level, questions encourage analysis, synthesis, evaluation .Audet & Jordan, 2005 Bransford Brown & Cocking , Chuska, 2003. There is large imbalance between convergent questioning and divergent questioning. The need of the hour is the paradigm shift from convergent to divergent questioning. The four factors are to be considered when looking at the results.

1. Tests of achievement and particularly tests of standardized achievement - use of multiple choice items tests the learners behavior at lower levels of cognitive complexity.

2. The diversity of responses are expected from divergent questions, the time needed to build and follow up responses may consume more class interaction time but it is worth spending.

3.The teachers are to be trained to develop divergent questioning skills, as it is leading higher order of thinking skills.

4.The critical thinking and the problem-solving are associated with the divergent questions. Writing process writing of Solar Energy, Wind Energy, Hydroenergy, Nuclear Energy, Tidal Energy, Biofuels, learning and building word power or vocabulary, derivatives, changing the functional unit of the word, The detection of toxic gasses, preservation and conservation of water, plant and animal life.

The convergent questioning is necessary for achieving higher-level behaviour . Buring, Norby & Ronning2004: Mayer, 2002. The Central Board of Secondary Education, NewDelhi encourages the students develop Higher Order Thinking Skills through Divergent questioning where as State Boards are still encourage Lower Order Thinking skills through Covergent questioning. The Indian Institute of Technology, Indian Institute of Science, and Indian Institute of Management studies adopt divergent questioning skills.

## TOOLS

**EXTENDING** A string of questions of the same type and the same topic.

**EXTENDING AND LIFTING** Initial questions examples and instances of the same type followed by a leap to a different type of question .

**FUNNELING** Begins with open questions and proceeds to narrow down to simple deductions, recall, and problem solving.

**SOWING AND REAPING** Problem posed, open questions asked followed by more specific questions and testament of initial problem.

**STEP-BY-STEP UP** A sequence of questions moving systematically from recall to problem solving , elevation or open ended.

**STEP-BY-STEP DOWN** Begins with evaluation questions and moves systematically through problem solving toward direct recall.

**NOSE - DIVE** Begins with evaluation and problem solving and moves straight to simple recall.

Source From "Asking Questions" by G. Brown and R. Edmondson in Classroom Teaching Skills -pp. 97-119 edited by E.Wragg.1984 published by Nichols Publishing Company.

**INTERVIEWING.** The students are interviewed about their learning a language, expressing their views, their likes and dislikes. The teaching faculty are interviewed about the strategies adopting to make teaching and learning interesting and challenging.

## PROCEDURE

Many teachers begin structuring - soliciting- reacting process by starting with an open question which leads to further structuring and asking subsequent questions involve recall or deduction. The general to specific approach can take different twists and turns. The teacher begins by encouraging speculative responses and then narrows the focus by asking a question require simple deduction.

Teachers frequently employ funneling : add conditions of increasing specificity to a question. This depends on the teaching goals, and the learning outcomes.

## III. RESULTS

The basic classification of the cognitive domain six levels of complexity. 1. Knowledge 2.Comprehension 3. Analysis 4. Evaluation 5. Application 6. Sythesis.

**KNOWLEDGE** The learner recalls, describe, define, identify, and recognise the facts that already learnt. The facts are linked systematically, gradually, systematically and developed into a composition. The teacher is to rationalize the questions represent task-relevant prior knowledge for subsequent learning. It is always advisable to ask reflective question Are the facts I am about to teach relevant for attains the desired learning outcomes.

**COMPREHENSION** questions require some level of understanding of the facts. The learner can explain, summarize, paraphrase, rephrase, and elaborate the facts learnt. Explain in your own words the concept water conservation, animal conservation and plant conservation.

Use passive form in writing a Report about the Factual description of the detection of toxic gases used in the mines. Write a flow chart of the solar energy, hydal electric power generation, the wind energy, the pedal energy, the biofuels, the geothermal energy, and the nuclear energy.

The learner must actively think about the material , logical, systematically and encourages the learners to retention, understanding by mind mapping.

## APPLICATION

Application questions uses the verbs apply, demonstrate, employ, operate, solve and demonstrate to extend the learners to the higher level of thinking. The learners apply the facts to a problem, context, or environment different from the learnt.

What is brain drain? What is reverse brain drain? Which is highly useful for India?

Will the use of helicopters solve the transport problem in Metro cities?

Will the use of bicycles solve the pollution, traffic, and health problems in educational institutions?

How are preserving, conserving the natural resources like water, plants and animal life?

Is Nature providing solutions to modern man's perniel problems?

How is technology solving the physically handicapped people?

The quality of the teachers' questions will determine how much the teacher change the problem, context, or environment. A small change will lead to a big invention. The learners apply their learning to think out of box to find new solutions. It develops the critical thinking and lateral thinking. Thinking differently leads doing things differently.

## ANALYSIS

Analysis is breaking down a big problem into small parts. The teachers use the action verbs like breakdown, distinguish, differentiate, and point out.

Differentiate between Mass production Vs. Production by Masses.

Distinguish between Nactornal animals from diurnal animals.

How does the breader reactor use the chain reaction for the energy?

The teachers evaluate the ability the learners ability to probe deep into the components of the problem.

#### SYNTHESIS

The teachers provide ample opportunities for the learners to create something new This level is associate with directly creativity-Anderson & Karthwohl, 2001; Marzano & Kendal, 2006. The facts, rules and action sequences, limits, and directions are required. The teachers use action verbs like produce, create, predict, formulate for synthesis.

Write the factual description of process of preparing ice-cream.

Write the factual description of preparing a bouquet.

write the factual description of origami.

#### EVALUATION

The teachers ask the learners to judge and make decision. This is the highest order cognitive skill. The criteria is adopted objective, scientific evidence, procedures. The teachers use following verbs like appraise, justify, assess, defend, judge and decide.

How does training play a vital role for increasing the productivity of an industry?

Do you justify the use of animals for experimentation?

Appraise the tourism as an industry.

#### IV. USING METACOGNITION FOR LEARNING LANGUAGE

Metacognition is a strategy for self- directed learning. The learners reflect their thinking by internalizing, understanding, recalling the content learned. This include self-checking, self-monitoring, self- regulating, self-efficacy and self-awareness.

Metacognitive strategies are most conveyed to learners through process by mental modelling. -Boyles, 2004; Duffy, Rochler, & Herrman, 1988; Dunlosky & Metcalf, 2008. Mental modeling helps the students to internalize, recall, and generalize problem to provide solutions to different content at a later time. The teacher mediates, helps to solve problems. Each of the tasks pose challenge for learners that can be addressed through modeling ways for the learners to organize their thinking.-Keene, 2007, Rekrut, 1999. Mental modeling involves three important steps

1. Showing the students the reasoning involved.
2. Making students conscious of the reasoning involved.
3. Focusing students on applying the reasoning.

The teachers provide ample, variety and challenging opportunities to the learners like Role Play. The learners understand the situation, recall their learning, think of ideas, draft the script, practice dialogue, and enact their role with their direction.

The teachers may assign the learners team tasks like Power Point Presentation, Telephonic conversation, interviewing, compeering, demonstrating, Group Discussion, and Debate. The learners develop problem solving, sharing their ideas, convincing, persuading others, negotiating, and team building skills.

Research on what makes a good demonstration indicates the following skill demonstration like Focus learners' attention, talk

in conversational language, makes simple steps, helps learners remember the demonstration and stressed the value demonstration. The teachers role mediating learning.

#### INTERVIEWING

The researcher interviewed the four of the faculty to know their views about convergent questioning and divergent questioning to develop language skills. They expressed that convergent questions are easy to administer, evaluate the learning and it is time saving whereas the divergent questioning is important, needed, but it is time consuming. They expressed there is every need of the hour implementation of divergent questioning important as the university is setting the questions using divergent questioning. The testing and measuring is done at the end as well as continuous assessment are done. The end semester examination should have at least 50% divergent questioning and 50% convergent questioning to set the students to think beyond text, and real learning takes place.

The researcher interacted with 20 students to know their opinion about convergent questioning and divergent questioning. Eight students felt convergent questions are easy to answer but it mere memorization is not real learning. Twelve students they preferred divergent questioning really helps them to right learning. This is due to the shift in question paper setting and evaluation of the university from content based to skill and application based . The industry and governance is looking forward this welcome change.

#### V. RESULTS & FURTHER STUDY

The researcher observes the learners aware of the different questioning strategy. The teachers introduces both convergent questioning and divergent questioning. There is a change in the learners and realize the significance of divergent questioning leaders to higher order of thinking skills. The learners feel there is joy of learning. The examination or test are meant for realize their real potential or understanding and application of their learning. It must not scare the learners and create tension. The aim of questioning is to build confidence and faith in themselves. the right types question stimulates thinking, triggers their imagination and use their mind to find solution. Here the teachers and the learners are to work as team. The teachers act as team to establish teaching and learning happens in joyful atmosphere. The classroom interaction and questioning is the source for traction research, the teachers as researchers to find solutions for their day to day interactions, bridging the gap between teaching goals and learners outcomes. The teachers are tobe sympathetic, compassionate, encouraging, supporting the learners learning outcomes. There are different learning styles for different learners as the teachers have different teaching methods. The quality of learning empowers them to live their learning. The true purpose of education is liberation from fear, anxiety, depression, ignorance, weakness but lead the learners to happy, joyful, healthy, confident, bold, courageous, problem solving, assisting , supporting the society and building the future thought leaders who can make the world better place to live in peace, happiness and prosperity. The classroom interaction, teachers' questioning will make learning and teaching a happening place to transform

the classroom a microcosm to macrocosm, preparing for the challenges of professional life with confidence and faith.

## VI. LIMITATIONS & AREAS FOR FURTHER STUDY

The present article is an attempt to use probing the questioning in Technical English language and developing L.S.R.W skills, English for Academic purpose. It does not cover literature, creative writing, scientific, business, writing, professional writing.

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