# EXPLORING THE CHALLENGES FACED BY THE TEACHERS IN DEVELOPING HIGHER ORDER THINKING SKILLS AMONG STUDENTS AT HIGHER EDUCATION LEVEL

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## Abstract

This study was designed to describe the importance of higher order thinking skills (HOTS) among students by the teachers; to analyze the availability of instructional facilities and to explore the challenges faced by the teachers in developing higher order thinking skills among students at higher education level. The theoretical framework of the study was based on the model of Bloom's revised taxonomy and higher order thinking skills by Mishra & Kotecha (2016). The model based on six dimensions named as remembering, understanding, applying, analyzing, evaluating and creating. The research approach was qualitative with case study research design. The population of the study was based on faculty members of the three different departments of the National university of Modern Languages, Islamabad. Convenient sampling was used as the sampling technique. Data was collected by open ended questionnaire. Data was analyzed by categories and sub-categories after that researchers established codes from the responses of the faculty members. The findings of the study revealed that higher order thinking skills are important because it help us to develop critical thinking skills and creativity. Teachers faced many challenges during the class like lack of time, cooperation among students, diverse mental level, large number of students and lack of physical resources. These challenges can be tackled by motivation and suitable teaching method.

**Keywords:** Higher order thinking skills (HOTS), Teaching and learning, Critical Thinking, Innovative Skills, Communication, Creativity, Collaboration

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## Introduction

In 21st century, education faces various challenges regarding the higher order thinking skills within the teaching and learning process. Educational institutions are created for the reason of transmission of information from one era to another (Ahmad, S. et.al 2017). Al-though with the passage of time, new teaching and learning methods or strategies were invented according to the cognitive abilities of the student's aiming of energetic input of the students in the classrooms. Moreover, higher order thinking Skills is also known as one the new teaching tactic. It has been noted that higher order thinking skills indulged students in thinking process in order to understand the facts and after that do something meaningful. For the higher education, higher order thinking skill is more essential for teaching and learning process (Velayati, N. et.al 2017). There are various researches, which reflect upon the importance of higher order thinking skills in higher education. However higher order thinking skills is a mental activity which is significant for the higher education students. Al-though it is a primary responsibility of a teacher to develop or boost up this ability within the students with the help of innovative technology (Lee, J., & Choi, H. 2017).

Therefore, thinking skills may spirited it in to two categories such as; higher order thinking skills and low order thinking skills. However, the primary purpose of the education is to move students from low order thinking skills to higher order thinking skill. Al-though higher order thinking skill belongs to the Bloom's taxonomy's first domain named as cognitive domain. The idea of higher order thinking skills have a part of the cognitive domain of blooms taxonomy (Tyas, M. A. et.al. 2019). Cognitive area of blooms taxonomy comprises 6 steps of learning such as:

- Evaluation
- Synthesis
- Analysis
- Application
- Comprehension
- Knowledge

The new version of blooms taxonomy comprises 6 steps such as Remembering, Understanding, Applying, Analyzing, Evaluating and Creating.

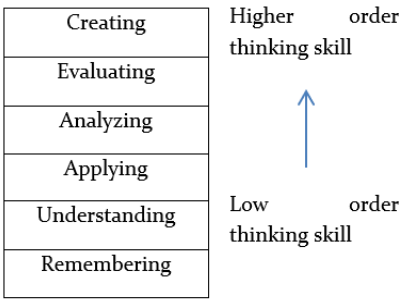



Figure 1: Bloom's revised taxonomy and HOTS (Mishra & Kotecha, 2016)

Nevertheless, developing higher order thinking skills seems to be a tough part inside teaching and learning procedure. Still development of higher order thinking is considered as an ample desirable strategy in 21th century to stand our learning standard. The fast-growing population in Pakistan and as well as in other countries is another problem which is causing overcrowding in the higher educational institution because the number of higher-level institutions remains lacking (Row, B. 2018).

## Literary Analysis

The 21st century presented its own methods. Human life is completely altered from the few decades, in common man got to innovation to discover information, data, make thoughts and create their concepts and shares them with others. As stated by different stakeholders in the P21's framework for 21'st century skills and learning needed to moves from subject to practice, from ICT to real life including higher order thinking skills HOTS. The government and teachers are responsible to must be aware about developing higher order thinking skills in new generation in 21st century.

Thinking skill is the most important skill that can be developed in the class for the achievement of the students. HOTS come from bloom taxonomy of cognitive domain that based on intellectual concepts and mental process. According to Marshall and Horton, higher order thinking skills consist of logical thinking,

critical thinking and reasoning skill which are the primarily skills in human life, in addition to academic achievement. Main characteristics of higher order thinking skill is creative and critical.

The 2013 curriculum demand one reason of teaching HOTs is to make students think more critically and creatively. Therefore, the teachers are expected to encourage higher order thinking skills among students. According to Brookhart HOTS contains various aspects like logic and reasoning, analysis, creation, problem solving and evaluation. This means developing of HOTS among students is necessary for dealing new problems in order to give solutions of these problems. Al-though at the stage of higher education, creative thinking is considered as a core component of the learning process. However, it needs highly involvement of the teachers towards boosting higher thinking skills among university students.

Higher order thinking is also known as higher order thinking skills. This is the fact that there are various taxonomies are being used for the purpose of boosting higher order thinking skills in the students. Higher order thinking skills includes series of vital skills such as; learning progress in the students, critical thinking, analyze and evaluate difficult material, interlink concepts, questioning, problem-Solving Strategies.

Bloom's taxonomy categorization was initially distributed in 1956 as a result of collaborative work with the cognitive psychologist at the University of Chicago. The concept of higher order thinking skills have an in-depth relationship with the cognitive domain of the bloom's taxonomy. Cognitive domain of blooms taxonomy includes 6 steps of learning such as; Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation. However, in 2001 with the collaborative work of cognitive psychologists, curriculum theorists, instructional scholars and testing and assessment experts published in 2001 a revision of Bloom's Taxonomy with the title "A Taxonomy for Teaching, Learning, and Assessment, A revision of Bloom's Taxonomy of Educational Objectives". The revised version of bloom's taxonomy included 6 steps such as; Remember, Understand, Apply, Analyze, Evaluate and Create. Additionally, the following figure of Bloom's original and revised taxonomies shows the difference among both of them.

Additionally, in 1982 the SOLO taxonomy was developed by Biggs and Collis as an alternative to Bloom's Taxonomy. SOLO taxonomy includes 5 levels of understanding such as; Pre-structural, Uni-structured, Multi-structural, Relational, Extended abstract. More comprehensively we can say that SOLO taxonomy moves forward from simple aspect to complex aspect.

Some studies show that teachers faced difficulties in developing higher order thinking skills in students. The reason behind is teacher have a lack of knowledge and skill about higher order thinking skills. They even do not have enough knowledge about how to develop HOTS's activities. Another problem is teachers are not able to evaluate of students' higher order thinking skill. The low capacities of teacher about HOTs make them difficult to compile HOTs questions. Students are faced problem to solve HOTS based questions. As a result, the purpose of developing HOTs is totally failed.

Implementing HOTs in classroom is not easy task, there must be needed a lot of effort. The four things teachers can do in HOTS teaching; these are, the open book questions that lead HOTS to start debate and discussion, at the end of lesson doing HOTS question that use assessment tool, during the lesion start brainstorming activities that deal with students' ideas (Afifah, R. I., & Retnawati, H. 2019). The main component of 21st century is that teachers want their learners use to higher order thinking skill (Saido, G. M., et.al. 2019). Higher order thinking takes a new level. Students need to be using it for understanding rather than memorizing facts. They would be able to connect them with another concept. There are some strategies that enhance higher order thinking skill in students.

- **Help Determine what is higher order thinking**

It helps students to understand what higher order thinking skill is. Explain to them why this skill is important for them. Help them to identify their strength and weakness.

- **Connect Concept**

Help students how to connect one concept with another. By this process you would be able to know what students are already known.

- **Encourage Questioning**

Encourage students to ask questions freely. Motivate them so that they can ask question without any negative reaction from their teachers and peers.

- **Teach problem solving strategies**

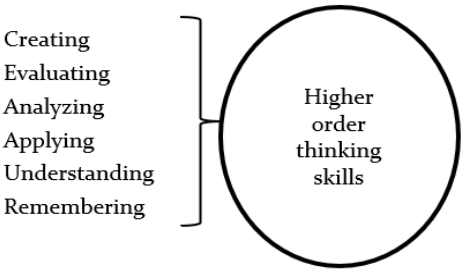
Teach your students to use step by step method for solving problems. This process helps them to use higher order thinking skill faster. Encourage students to solve their own problem using HOTs.

- **Encourage Creative Thinking**

Creative thinking will be used by students when they imagine and design their thinking. Research shows that when students used higher order thinking skill, their understanding level increases.

## Conceptual Framework

The particular conceptual framework based on Bloom's Revised Taxonomy and Higher Order Thinking Skills by that focuses on the relation of higher order thinking skills (HOTS) and teaching is inter-connected. Higher order thinking skills is related to the higher level of the cognitive domain of bloom's taxonomies upper part steps and these steps are trying to prominent in the following figure. (Mishra, R., & Kotecha, K. 2016).




Bloom's Revised Taxonomy and Higher Order Thinking Skills by Mishra & Kotecha (2016)

### Significance and Rationale

In the existing study, the researches try to search the challenges in developing higher order thinking skills among students at National University of Modern

Languages, Islamabad. Moreover, this study is much informative and helps to know the challenges in developing higher order thinking skills among students. It also helps to develop a more focus towards the challenges in developing higher order thinking skills among students at higher educational institutions. The current study is significant for teachers in order to boosting creative, critical thinking skills among students. However, it also supports teachers to know the challenges and possible ways to handle it, which create hurdles on the technique of making higher order thinking skills among students. It also helps students to understand the concept of higher order thinking skills and reminding them that higher order thinking skills includes not only the ability of memorization but also the ability of thinking.

Additionally, this study is also helpful for the administration of educational institutions to plan and conduct training programs for teachers in order to boost up their teaching capabilities. Curriculum developers would add those activities which help teachers in developing higher order thinking skills among the students. This would also motivate the whole concerned authorities to do some actions in this regard.

To ensure the achievement and strength of coming era, there is an excessive need of well-organized and modernized version of educational arrangement which could stand with changing technological era. Since the past few decades, numerous attempts have been made by the educational organizations to be able to educate the students, with the help of new teaching techniques and equipment's. The main agenda of many educational institutions is to sequence the students and their minds with more creative, critical and reflective thinking (Olusola, O., Ajayi. 2016). Moreover, the ideas of higher order thinking skills are very important and have a deep connection with the cognitive domain of the bloom's taxonomy. Cognitive domain of blooms taxonomy includes 6 steps of learning such as; Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation.

In situation of Pakistan, it is evident that after its formation it is continuously facing numerous difficulties such as: Political, Social, and Economic and in educational structure as well. It is a fact that educational system plays an important role for the development and sustainability of any country and no one

can disagree its importance (Ngah, N., et.al 2017). Pakistani educational system is divided into three sections such as; Elementary, Secondary, Higher. However, this particular study pays special attention on the higher education. In higher educational system, it is a stage where students can think critically. Higher order thinking skills includes facts and observations regarding particular phenomenon. At higher level it has been saw that teachers face challenges to developing higher order thinking skills within students such as; strengths of students, size of the classrooms, absence of collaboration among teachers and students and different cognitive abilities of the students (Afandi, A. 2018).

Furthermore, the current study includes the challenges faced by faculties which are struggling to develop higher order thinking skills among students along with the vital components of teaching and learning such as; rising critical thinking, innovative skills, Technology literacy, Communication, creativity, collaboration and global awareness in order to meet international standards of education.

It is difficult for the teachers in boosting up higher order thinking skill when students do not actively participate in the teaching and learning process. However, it is not possible for teachers to concentrate on each student due to strength of students, time limitations, lack of sufficient resources such as; technological resources and physical resources.

## Methodology

The research design of the particular study was qualitative case study. It provides a strong way of understanding the complex phenomenon. The population of the current study was consisted of faculty members of 3 departments such as; Pakistan studies, Education, Soft-wear engineering of National University of Modern Languages (NUML), Islamabad. The faculty members of all above mentioned was also the respondents in this research study.

In the process of selecting the sample for particular study, the researchers selected convenient sampling technique. A convenient sampling (Afandi, A. 2018) refers to the selection of group of people who are easily, found and available to be studied. The convenient sampling technique is effective because it helps the researchers to easily approach the targeted population.

The researchers found those respondents who were easily available for the purpose of data collection of the current study.

- **Data Collection Tools and Process**

The particular study is qualitative in nature, so the open-ended questionnaire is used as a data collection instrument. The researchers developed open-ended questionnaire to collect data. Open-ended questionnaire was developed for the faculty members in order to explore the challenges in developing higher order thinking skills among university students. The researchers select open-ended questionnaire as a data collection instrument, because it helps the researchers in order to get detailed explanation of the under-discussion phenomenon. As the current situation of pandemic and the busy schedule of faculty members, mostly open-ended questionnaire sends it to faculty members via email.

The above table shows that there are 15 faculty members in which 10 percent were male and 5 percent were female respondents. Out of these respondent's 20 percent were between the age of 25-30,53 percent were between 31-35,27 percent were between 36-40. Out of sampled respondents,33 percent have M.A/M.S.C degree,53 percent have MS/M.Phil. degree. Moreover, there are 40 percent have 2-3 years of teaching experience, 27 percent have 4-5 years, 33 percent have above 5 years of teaching experience.

- **Ethical Consideration**

Research ethics joins to preserve the rights of candidates and they guarantee that they are secure from needless devastation, and guarantee these approaches are applicable to the study purpose (Mooney, J., & Olsen, A. 2016). Researchers tries to not influence on faculty members schedule or routine, researchers had to email open-ended questionnaires to teachers, so that they can easily give responses on the open-ended questions according to their feasibility.

- **Data Analysis Technique**

In the process of data analysis, firstly researchers highlighted categories and sub-categories from open-ended questionnaire. After determining categories and sub categories, researchers established codes from the responses of the faculty

members through open-ended questionnaire. Therefore, researchers analyze data from the perspective of faculty members.

**Data Analysis from Teachers - Category: 1**

| **Category** | **Sub-Category** | **Challenges in developing higher Order thinking Skill** | **Emerging Coding** |
|---|---|---|---|
| Opinion | Importance of Higher order thinking skills | "It is an important skill because it helps us think critically and creatively."<br><br>"To develop critical and analytical thinking of students. Higher order means where students can correlate information and knowledge from different subjects."<br><br>"Critical and higher order thinking is equally important in societies like us where education is already subject to devastation. It should be encouraged in class rooms and different methods should be consulted in order to make facts understood."<br><br>"Three thinking must be in a part in a technical mind namely; critical thinking, creative thinking, practical thinking, holistic thinking."<br><br>"Basically, it promotes essential skills such as critical thinking and problem-solving. It develops sense of defending or justifying opinions and beliefs create new ideas and alternatives. It focuses more on how we think, rather on what we think."<br><br>"It is indeed very important to create and build higher order thinking skills in students so that they can meet the current challenges of the world." | • Important Skills<br>• Correlate Information<br>• Significant<br>• Creativity<br>• Justification of ideas<br>• Need of time<br>• Synthesis<br>• Boosting skills<br>• Development of ideas<br>• Self-learning<br>• Tackling challenges<br>• Problem solving |

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| | | "Higher order thinking skills includes creativity, Analysis, Synthesis and critical thinking."<br><br>"Higher order thinking skills are important within the process of teaching and learning. It boosts up many skills of the students such as; creativity, Analysis, Synthesis and critical thinking."<br><br>"Basically, it promotes essential skills such as critical thinking and problem-solving. It develops creativity and develops new ideas."<br><br>"Higher order skills include critical thinking, inquiry skill, creating skill, self-learning. These all skills are important in order to make student more independent."<br><br>"Higher order thinking skills are important for the students because in this way they can face the challenges more appropriately."<br><br>"It includes critical thinking, creative thinking, and problem-solving thinking. Higher order thinking is much important at higher level." | |

**Data Analysis from Teachers - Category: 2**

| **Category** | **Sub-Category** | **Challenges in developing higher Order thinking Skill** | **Emerging Coding** |
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| Challenges in the classroom | Teaching Process | "If students do not ready for the class then it becomes difficult to teach at higher level. The rest of the problem is the willingness of the students to learn and avoid short cuts | • Willingness<br>• Plagiarism/analysis/expression<br>• Lack of time/cooperation<br>• Engagement of students<br>• Dealing of class<br>• Lack of team work<br>• Disrespect to teachers<br>• Lack of interest<br>• Lack of resources<br>• Shortage of time |

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| | | during this process."<br><br>"Thinking level of analysis/expression is different in students because of the difference of their previous education and their societal structure as well. Plagiarism is another challenge specifically in research activities."<br><br>"Major problems during class include lack of time and lack of cooperation among students."<br><br>"Engage those students which loss the concentration and Divergent of students mind with passage of time."<br><br>"Challenges like there is lack of teamwork and support between students. Limitations of Disciplining Students, there are some cases of serious disrespect towards teachers and the rules safeguarding students can be a headache for teachers. Dealing with a silent class is yet another classroom challenges and besides all these we made accountable for more than we do."<br><br>"I face many challenges during teaching in the classroom including lack of interest of the students, lack of | • Basic thinking<br>• Discipline problems<br>• Dealing with slow learners<br>• Diverse backgrounds<br>• In active Participation of students |

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| | | proper resources, unavailability of internet and sometimes shortage of time."<br><br>"The teachers are still at basic thinking level, themselves."<br><br>"As a teacher we faced main problems are; Discipline problem Maintain unity in the class<br><br>Handle slow learners."<br><br>"Maintaining discipline among students, Dealing with slow learners."<br><br>"Challenges faced in classroom are; Involvement of the students, unavailability of internet."<br><br>"Shortage of time, Maintaining discipline in the classroom."<br><br>"Diverse learning backgrounds of the students."<br><br>"Active participations of the students."<br><br>"Engagement of the slow learners in the classroom." | |

**Data Analysis from Teachers - Category: 3**

| Category | Sub-Category | Challenges in developing higher Order thinking Skill | Emerging Coding |
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| Diverse mental level | Challenge in classroom | "Having diverse group of students is normal because this is how the society is also formed. We have multiple intelligences, needs, emotional and other kinds of background among the students. They represent our society so we need to incorporate that as a part of pours teaching."<br><br>"Not always but sometime it is because of the diverse mental level it became difficult to transfer the knowledge and information equally and neutral."<br><br>"Most of the time it is not an issue because a teacher is supposed to deal such challenges during class. When you are prepared with the topic you can handle multiple opinions and diverse personalities in much better way."<br><br>"Yes, mind mapping is the challenging especially if you work on the current technology with complex scenario."<br><br>"Yes, this is a big challenge in the | • Incorporate/multiple intelligences/needs<br>• Transfer knowledge/information<br>• Preparation of topic<br>• Mind mapping<br>• Low IQ<br>• Big challenge<br>• Hurdle for teachers<br>• Inertia<br>• Low concentration<br>• Complexity<br>• Huge problem |

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| | | classroom." | |
| | | "Yes! The diverse mental level of the students in classroom is a challenge. Students having low IQ level cannot concentrate properly as compared to other students. They require more time for understanding and absorbing a specific phenomenon." | |
| | | "Yes, indeed this created a great deal of problems for me in a class sitting. It is one of the biggest challenges to keep up with diverse mental levels." | |
| | | "Yes, Active learner and slow learners within the classroom is a hurdle for teachers." | |
| | | "It is always remaining there; otherwise the world would in inertia." | |
| | | "Yes! The diverse mental level of the students in classroom is a challenge. Students having low IQ level cannot concentrate properly as compared to other students." | |
| | | "Yes, sometime genius students work complete at time while average students face complexity and take | |

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| | | some time."<br><br>"Yes, it is."<br><br>"Yes."<br><br>"Yes, it is difficult for teachers to teach them."<br><br>"Yes, a most common and huge problem during teaching." | |

**Data Analysis from Teachers - Category: 4**

| Category | Sub-Category | Challenges in developing higher Order thinking Skill | Emerging Coding |
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| Lack of resources | Implementation of Strategies | "Sometimes, yes because we need resources and freedom in making choices how we want to plan our teaching/learning experience."<br><br>"Yes."<br><br>"Yes. It is a big task for teachers to complete their responsibility with minimum resources. More resources mean more power at teachers end to generate maximum outcome."<br><br>"Yes."<br><br>"Integration of scalable hardware | • need resources/freedom<br>• Responsibility<br>• Integration<br>• Interpretation of novel ideas<br>• Exchange of information |

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| | | with experimental studies creates a hurdle especially when you are interpreted the novel idea." | |
| | | "Yes, because teachers are just exchanging piece of information with students. They have less domain knowledge of understanding the psyche of students. It us because there are not facilitated with good trainings and knowledgeable seminars which improve the skills of students. Being a teacher, we are restricted to do extra curriculum activities which boost up the skills of students. Management's | |
| | | Pressure and race of completing the entire course has restricted us to apply those useful strategies that develop higher order thinking skills." | |
| | | "Yes, the lack of resources restricts me to implement the strategies which develop higher order thinking skills." | |
| | | "I don't think so." | |
| | | "Yes, because teachers without resources and facilities cannot be able to teach students in better | |

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| | | way."<br><br>"Yes, it is main issue that we faced in the class. We have no facilities or resources that we implement our needed strategies."<br><br>"Yes."<br><br>"Yes, in some situations."<br><br>"Yes, to some extent."<br><br>"Yes."<br><br>"Yes, because in this way we can implement teaching strategies effectively." | |

**Data Analysis from Teachers - Category: 5**

| Category | Sub-Category | Challenges in developing higher Order thinking Skill | Emerging Coding |
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| Large number of students | Creating Higher order thinking skills | "Yes, it is because it divides the attention of the class and makes it difficult to attend to the needs of all students. It is congested and students also do not like to participate in a class that is large. Higher order thinking requires employing activities and exercises that need personalized | • Individual attention<br>• congested<br>• Diverse mental level<br>• Interesting<br>• Useless for transformation of knowledge<br>• Difficulty in individual attention<br>• Using ready-made solution<br>• Ignoring individuality |

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| | | academic attention."<br><br>"Yes, because again it is difficult to make all the students to understand the subject because of their diverse mental level and educational background as well."<br><br>"NO. In fact it's interesting to have large number of students in classroom."<br><br>"No, I don't think so. The scale of students is not matter in transformation of knowledge."<br><br>"Yes."<br><br>"Yes, it is because sometimes it becomes very difficult for me to pay attention to all of the students."<br><br>"Yes."<br><br>"Yes, Teachers are unable to identify the problem and don't think over solution of the problem. They rely on written notes and ready-made solutions rather than critical thinking and idea generation."<br><br>"Yes, highly strength is a main reason for ignoring individuality. We did not time to give attention on individual student and solve his | |

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| | | problem." | |

**Data Analysis from Teachers - Category: 6**

| Category | Sub-Category | Challenges in developing higher Order thinking Skill | Emerging Coding |
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| Instructional and physical facilities | Classroom | "The biggest concern is the number of students and the available resources for them in the classroom. Secondly, the teachers do not include them in their learning process and hence they are reduced only as consumer of already assigned knowledge."<br><br>"Our institution has developed a lot during last few months and has improved classroom facilities."<br><br>"Positive mapping of instructional and physical facilities is the tough job especially if you are working in a e-classroom (online mode)."<br><br>"As far as my classroom is concern that is equipped with multimedia and white board. These facilities are enough for my course which is teaching."<br><br>"The situation is good to an extent but it surely needs some up gradations such as | • Strength<br>• Improvement<br>• Difficulty in e-learning<br>• Multimedia using<br>• Ready-made solution<br>• Ignoring individuality<br>• Need availability of internet<br>• Demonstration by chart<br>• Satisfactory<br>• Average resources<br>• Models/whiteboard<br>• Acceptable<br>• Need improvement<br>• Depends on student's strength<br>• Typical situation |

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| | | the availability of internet in every classroom."<br><br>"Normal."<br><br>"I used multimedia and whiteboard or sometime I need to explain with the help of chart."<br><br>"As a teacher I used multimedia and whiteboard. Sometime teachers used models for more explaining of the topic."<br><br>"Satisfactory."<br><br>"The overall condition of instructional and physical resources in the classroom is average."<br><br>"Acceptable."<br><br>"Repair the physical resources."<br><br>"Need more improvement."<br><br>"It depends on the strength of the students in the classroom."<br><br>"The situation is typical in the classroom." | |

**Data Analysis from Teachers - Category: 7**

| Category | Sub-Category | Challenges in developing higher Order thinking Skill | Emerging Coding |
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| Greatest Challenge | Building Higher order Thinking Skills | "They lack activity, creative thinking and resources to do what they should and like to be doing. They also do not want to work more for their own learning that affect their students also. The system of education is also designed in a way that promotes lower order of learning's.<br><br>"Infrastructural gapes, lack of research skills, promulgation of true and real knowledge/facts/history."<br><br>"Extremism. Students have extremist approach towards whatever they think of believe."<br><br>"Traditional content of study material is used to transform the skills set of students in industrial perspective."<br><br>"Teachers lacked knowledge in thinking skills and were unskilled in applying thinking skills.<br><br>"The teachers have to be very careful in creating a suitable environment to build the higher order | • Educational system<br>• Lower order thinking skills<br>• Extremist approach<br>• Traditional content<br>• Lack knowledge about HOTs<br>• Build suitable environment<br>• Teacher's qualification<br>• Need teacher's training<br>• Transform the skills |

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| | | thinking skills because sometimes the students may experience a sense of inferiority. So, the teacher should be very conscious."<br><br>"Teacher's qualification."<br><br>"In developing higher order skill, we need to trained teachers. Teachers have no expertise in skill development."<br><br>"Traditional content of study material is used to transform the skills set of students in industrial perspective." | |

**Data Analysis from Teachers - Category: 8**

| **Category** | **Sub-Category** | **Challenges in developing higher Order thinking Skill** | **Emerging Coding** |
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| Motivation | Active learners | "To ask them questions, to give them task that get them engaged in the learning activity, to empower them to take charge of their learning. Give them method to approach their learning from multiple dimensions."<br><br>"By constantly giving them small tasks/activities. Through detailed discussions in class | • Questioning<br>• Discussions<br>• Debate<br>• Manageable content<br>• Freedom in criticism<br>• Discussion freely<br>• Instructional strategies<br>• Active participation<br>• Motivate to students<br>• Self-confidence<br>• Appreciation<br>• Respect other's opinion<br>• Practical work<br>• Using technologies<br>• Dialectic approach |

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| | | rooms."<br><br>"I encourage my students to raise questions and to debate their thoughts. Sharing of different thoughts is first step towards debate."<br><br>"Use the theme of Work Break Down structure (decompose the study content in manageable chunks) and Perfect mapping of study content with industrial perspective."<br><br>"Be free with praise and constructive in criticism."<br><br>"I try to give them a fair opportunity to communicate with me and other students. I indulge themselves in activities which may be helpful in creating HOTS."<br><br>"Through instructional Strategies."<br><br>"Become a role model for student interest, use a variety of student-active teaching activities, Be free with praise and constructive in criticism, Make them independent learners and don't use negative words for them."<br><br>"Motivate student | |

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| | | such as; Group discussion and appreciate them, Question and answer and develop self-confidence, project method and create them confident on yourself."<br><br>"Appreciation."<br><br>"Valuing of each one's point of view."<br><br>"Discussion."<br><br>"Involve students in practical work."<br><br>"Encouragement."<br><br>"Use of technology."<br><br>"Dialectic approach." | |

**Data Analysis from Teachers - Category: 9**

| **Category** | **Sub-Category** | **Challenges in developing higher Order thinking Skill** | **Emerging Coding** |
|---|---|---|---|
| Suitable method | Higher order thinking skills | "To make them independent learner and help them understand their own learning needs and how to fulfill them independently. If you teach them how to think and do for them, it becomes easy for them to succeed."<br><br>"Analytical method | ❖ independent learning<br>❖ Analytical method<br>❖ Reasoning and analysis<br>❖ Self-study<br>❖ Demonstration method<br>❖ Technologies trends<br>❖ Problem solving activity<br>❖ Project method<br>❖ Discussion method<br>❖ Encouraging practical work<br>❖ Communicating with learners<br>❖ Dialectical method<br>❖ Experimental work<br>❖ Self -learning |

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| | | is the most suitable method."<br><br>"Self-Study."<br><br>"Reasoning and analysis (first at individual's level and later at class room level)."<br><br>"Demonstration method."<br><br>"Continuously industrial visits and bring the industrial trend and technologies on same platform where theoretical framework exists."<br><br>"Problem-solving activities."<br><br>"Project method."<br><br>"Discussion method."<br><br>"Higher order thinking among students can be improved by given them more particle task rather theoretical so they can enhance their skills by practicing in real time."<br><br>"Frequent communication and brain elevation related activities."<br><br>"Dialectical approach." | |

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| | | "Practical or experiment task."<br><br>"Using Problem solving activities, Self-learning or project method."<br><br>"Discussion method." | |

❖ **Findings**

**Category 1**: opinion, higher order thinking skills are important because it helps us to develop critical thinking and creativity. It develops sense of defending or justifying opinions and beliefs for creating new ideas and alternatives. It focuses on "How we think rather then what we think". Higher order thinking skills based on creativity, analysis, synthesis, and critical thinking. These abilities are important in every student so that they can face any challenges and solve their problems independently.

**Category 2**: Challenges in the classroom; during class teachers faced many challenges, the major problems are lack of time, lack of cooperation among students, engage those students those loss the concentration, lack of proper resources, unavailability of internet and discipline problems. As one respondent defined that limitation of disciplining students, some serious type of cases arrived towards teachers and the rules safeguarding students can be main headache for us. One challenge is to deal with slow learners.

**Category 3**: Diverse mental level; sometime diverse mental level become difficult for teachers to transfer the knowledge and information equally. When teachers prepared their topic, they can handle multiple opinions and diverse personalities in a better way. By the opinion of one respondent, the diverse mental level of students in class becomes a challenge. Students having low IQ level can't concentrate properly as compared to other students. They required more time for understanding. Sometime good students complete their homework while slow learners face complexity and take time.

**Category 4**: Lack of resources; lack of resources badly affected teacher's strategies as teacher need to resources and freedom to make decision about planning and teaching methods. It is a big task for teachers to complete their work with short resources. One of our respondents defined that as teachers are just exchanging piece of knowledge with students. They have less domain knowledge of understanding the nature of students. It us because there is not facilitated with good training and seminars which improve the skills of students. Being a teacher, we are restricted to do extra curriculum activities which boost up the skills of students. Due to lack of resources we are not able to implement on strategies.

**Category 5**: Large number of students; it divides the attention of the students and make it difficult to attend and explored the needs of all students. It makes a congested situation and students also do not like to participate in large class. Higher order thinking skill requires individual attention. It is difficult for students to understand the subject because they have diverse mental level and educational background as well. Highly strength is the main reason for ignoring individuality. We don't have time to give individual attention and solve their problem.

**Category 6**: Instructional and physical facilities; an ideal educational institute must have certain minimum and basic physical resources in school. In the absence of physical resources affects the quality of education and efficiency of teachers. Physical resources have a great impotence in the school. These resources are classroom, whiteboard, multimedia, models, charts, science laboratory, and library.

**Category 7**: Greatest challenges; Educational institution have lack of activity, resources, infrastructural gaps, lack of research skills. Teachers have a lack of knowledge and skill in applying their experiments approaches. Teachers have to be very careful in creating study environment to build the higher order thinking skills. Traditional methods are used to transform the skills and information.

**Category 8**: Motivation; motivate students such as; group discussion and appreciate them, question and answer and develop self- confidence, project method and develop them confident on yourself. As a teacher become a role model for students, use a variety of active teaching activities, be free with praise and

constructive in criticism, make them independent learners and don't use negative words for them.

**Category 9**: suitable method; as a teacher it's our responsibility to make learners independent and help them to understand their own needs and learning problems and try to solve them independently. Methods that are suitable for teaching are analytical method, self-study, demonstration method, problem solving method, project methods, and discussion method. Higher order thinking skills can be develop by given more practical work rather theoretical.

**Recommendations**

- Educational institutions may need to minimize the strengths of students within one class that might be easy to manageable for single teachers.
- Developing higher order thinking among university students requires more time and efforts by the teachers. So, the commitment of teachers is considered more important.
- Teachers may need to modify the methods of teaching.
- Teachers may determine certain discipline for classrooms so that students would not misbehave with teachers.
- Students may learn to find out the required information, judge it and think in order to build higher order thinking skills.

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