

## EXPLORE THE INTEREST OF HIGH SCHOOL STUDENT IN MATH AND THEIR ABILITY TO THINK CRITICALLY IN PERCEPTIONS OF TEACHERS

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### ABSTRACT

*Critical thinking is an ability that is a part of mental processes and evaluation. It is a sensible thought that concentrates on determining what to believe. This research aims to explore the views of teachers regarding students' interest in the subject of math. Qualitative research was conducted. The qualitative data collected from these selected educators reflected their personal beliefs and teaching practices. The obtained data was transcribed, coded, analyzed, and synthesized in order to uncover patterns. The primary source of data collection for this research study came from interviews. The interviewees were experienced educators in Lahore. There was flexibility in the construction of the interview and the report was developing between the researcher and interviewees by using interviews to collect data. Findings from the study showed that critical thinking results in the ability to draw the right conclusions more often. Improving students' critical thinking ability has a knock-on effect on their problem-solving ability, openness, creativity, organization, planning, and ability to make good decisions in life.*

**Keywords:** Critical Thinking, Motivation, Student Engagement

### Introduction

Student engagement is defined as an observable behaviour like using time for tasks (Natriello & Brophy, 1983). Some researchers define the aspects of emotional engagement. In both definitions, researchers define the enjoyment, feelings, attachments, and belongings of the student (Connell, 1990). Cognitive engagement is different from behaviour and emotional engagement. In cognitive engagement, we see the student's investment in learning, challenges, and other aspects that are related to the mind (Fredricks, Blumenfeld, & Paris, 2004). Some researchers gave the models of student engagement, according to Finn. The earliest theory was the participation-identification model. This theory is about both behavioural and emotional engagement. Behavioral relates to participation, and emotional relates to identification (Finn, 1989). Moreover, scholars have used different terms to describe student engagement, like student practising in class, sharing with an organization, teacher participation, association in schoolwork, involvement with academics, etc. Some scholars divide engagement into two dimensions: one is behavioural and the other one is emotional engagement. We can include efforts, behavior, participation, and positive behaviour in behavioural engagement, and values, interests, emotions, and belongings, among other things, in emotional engagement (Finn, 1989). The influential model was another model. This model was developed by Connell and his colleagues (Connell, Wellborn, & Belmont, 1990; 1991; 1993). They are divided into two parts. 1. engagement 2. Dissatisfied work patterns Those students who appear to be engaged do so in their presentations. And disengaged students are passive. They don't try to work hard, show negative emotions, always blame others for their mood swings, and anger people (Skinner, 1993). Student engagement is not a single term. It has multiple dimensions, such as cognitive, behavioral, and emotional. In cognitive engagement, we see the level of investment that a student shows in his learning. It is very purposeful and thoughtful in school tasks. Basically, cognitive engagement is related to the mind and thoughts. It gives me the idea to do work. It gives all the tasks to the brain to complete the tasks by using skills (Fredricks, Blumenfeld, & Paris, 2004). In behavioural engagement, we see the level of participation and involvement in academic and all that work which is related to academic, such as co-curricular activities. It gives affirmative educational results and also stops dropouts (Connell, Wellborn, & Belmont, 1990; 1991; 1993). In emotional engagement, we see the level of focus toward work. Teachers, institutions, classmates, and the environment are all factors that can engage a student. The student's enthusiasm and determination for work in an organisation or school, imagining emotional engagement (Connell, 1990).

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Student engagement plays a vital role in fulfilling fulfilment desires and all the levels of student development. Students show engagement when they are motivated with enjoyment, interest, curiosity and when they fulfil their personal goals. Students took meaning as part of their learning by using cognitive skills and critical thinking. A teacher plays an important role in student engagement. He works like a facilitator, helper, instructor, etc. Teachers become overly capable of assisting their students in creating problems, solving problems, and creating and evaluating information through the use of critical thinking skills. They create a peaceful and meaningful environment to encourage the students (Caram & Davis, 2005).

Researchers and policymakers are focused on problems such as high dropout rates, student boredom, low achievement, and alienation by using student engagement. (Fredicks, j, Blumenfeld, & Paris, 2004). Nowadays, students show a high level of disengagement; an estimated percentage is 25–40%. The reason is that they are not involved in their studies; they are not trying hard; they are not giving attention to study etc. (Steinberg, Brown, & Dornbush, 1996 ; Yazzie-Mintz, 2007).

### **Cognitive Engagement:**

Mathematical learning is the memorization of rules in a better method. In learning, I emphasize memorizing completely important formulas. I don't prefer to understand the principles of those formulas. Memorizing the basic concept of a topic is much better than understanding it holistically. Memorizing is a perfect and effective way of learning. According to memorization, we'll be able to solve the problems by using different methods. I am curious about new things, but I memorize what I have already learned and what is new during that time. The good process in mathematics education has to practise or repeat the problem again and again. The understanding of mathematics has become more popular than memorizing it. In mathematics, I thoroughly understand the rules and apply them in my daily life. These things are helpful in daily life situations. In the reading curriculum, I focused on those questions which create new knowledge, generate new ideas and address a few concerns with reading material. I have used this knowledge in regular life and also related it to different subjects. The researcher's time to seek knowledge, understanding, and interest in mathematics during the classroom. Many questions come to my mind, and these questions help me to enhance my ability and generate new knowledge. Students use their free time to practise all of the questions they learn in class. When students have listened to their teacher, observed his method, and obeyed his rules, then they learn in the best way. They follow the medium of instruction that the teacher used and solve all the problems easily. Some of them remove their quarries through increased practice.

### **Affective Engagement:**

It is all related to emotions. Students take interest in and passion for learning mathematical skills and feel relaxed. They show their participation to remove the queries within the class. When students complete their practise after the lecture, they feel relaxed and delighted. They play their role in generating new ideas that will be helpful for them. Learning mathematics is wonderful for them. They show their positive behaviour and excitement to begin a new lesson. They used different techniques to fix the problems. Then they modify their satisfaction. Students look cheerful when they get good grades. When they see good and positive results, then they forget their boring and hard effort. They show their satisfaction at getting a good result.

### **Anxiety**

How do students show their stress during the classroom? They show their nervousness in the mathematics exam. They looked pale during the assessment. When they read difficult questions, they feel nervous about completing them. They show their wariness over poor results. The teacher gives them confidence and increases their participation level, so they can fight with it. Otherwise, math anxiety will become a burden on a student's mind and they will not be able to do anything.

### **Frustration**

Students show their anger when the teacher teaches a new lesson and gives new knowledge. They show their irritation and anger. They feel bored. They don't show their participation. They don't like math. When mathematics does not fulfil a student's desire or demands, they show annoyance. Students can remove their frustration, but they need time.

### **Engagement in Behavior**

They listened to the lecture with full attentiveness. Students show their interest and participation in the new lesson by asking different questions. They present their efforts on new goals they have concentrated on to gain new knowledge or ideas about mathematics. Teachers can measure this type. Students' grades, classroom behavior, interests, and participation are all included in behavioural engagement. All curricular and co-curricular activities are part of this engagement. The teacher used positive talk in his lecture. It identifies all child behaviours and characteristics. It focuses on how to manage an organization as a practicing teacher. They try again and again to complete the task and remove difficulties. If there were many difficulties, they tried until they removed them. They used different methods to understand them. Critical thinking skills and creative thinking skills are increasingly needed by 21<sup>st</sup> century students because they are living in a modern and global world. These skills help the students to learn independently for life. Critical thinking has some basic activities like investigation, evaluation, and interpretation. In evaluation, it is the process of argument and determining the difference between appropriate and inappropriate. It is very much needed in education. We have four basic reasons. First, it gives moral education to the students. Second, students understand by using their direction and sufficiency. Third, education by using goals and objectives with the help of math, science, and history, etc. Forth, good thinking, accuracy of analysis, and consideration in self-government. So the result is that critical thinking skills are very important in education.

It is focused on the grading level of school, career, and profession. Students' behaviours depend on the problem-solving skills of students that help them to take any decision. In Pakistan, school organizations have a lack of sources to learn and think critically. The school conditions do not provide opportunities or abilities to think creatively. School management has no facilities in which students can show their ideas. So we can say students' thinking ability levels are very low and the education system is responsible for this. Teachers just ask the students to learn, but they don't give them the direction on how to learn, how they can solve difficult problems, and critical thinking. The critical thinking skills of secondary school level students will be enhanced when they remove their issues that come up in learning. They develop their environment and social interaction. It is a technique that utilizes high school or undergraduate students. Much of the research describes how we will enhance students' self-regulated and directed learning in education. PBL helps the students in different ways. To increase mutual understanding and awareness Grow productive issue-removing skills. Enlarge egocentric endurance abilities. Successful collaboration naturally, this influenced learning. Instructors and educators would be able to spread reflective thinking skills by using PBL. instruments and implement them. Before using them, they checked their logic and trustworthiness. Teachers have used their different strategies. These strategies are planned by teachers for learning. They have used these strategies in their daily classroom. Critical thinking responds to different people's thoughts that can abstain, stop emotions, and believe before doing. In PBL, students are expected to have reflective skills that are sincere and able to respond to controversial problems like an engaging dare and manage conformational decisions. Key elements of analytical, logical include artificial practicable are the basic part of reflective thoughts. People should be able the critical thoughts examine and assess up to date standard aims, by using analytical thinking skill.

### **Critical thinking**

Fischer said that John Dewey was the father of reflective thoughts. All reflective thoughts are usually used for critical thinking. Another person that is very famous for reflective thinking was Watson Glaser. He described it in various parts, like All things considered, on the limit of a single person's knowledge and prepared different points of view. Different comprehension procedures that have rational investigation and understanding. variety of abilities that are used for procedures .Masek and Yamin describes that one thing that academically helps in the enlargement of a pupil's critical thinking is problem-based learning procedure.PBL has very few effects on the practice of

medicine. It affects students' reflective thinking abilities. Academic achievement, student age, educational background, and identity are factors that affected PBL and reflective thoughts. In a learning environment, we solve all problems just due to reflective thinking. They can find many solutions to one problem. They provide different suggestions and use them to solve all the issues. A creative thought procedure has been based on cognitive and constructivism approaches. PBL is very effective for students. It encourages students' collaborative learning, constructing knowledge, independent learning, and high thinking. In critical thinking, some aspects are included, such as school, teacher character, and students' attitude, thinking level, and problem solving skills.

### **Conceptualization of critical thinking**

Some common core skills that are the part of critical thinking skills are decision making, evaluative thinking, inference, reasoning, problem solving and transfer. These abilities have been associated with high-level mental cognition or critical thinking skills (Leou, 2006). Dewey (1910) and Ennis (1987) define reflective thinking skills as a path of thoughtful reasoning at a level of thinking that concentrates finally on thinking and behaving. Ennis defines some different cores of critical thinking. The question was given a basic explanation. Questions should be relevant. The question includes identifying a problem and a hypothesis. But it should be in the form of a question. Basic support focuses on the ability to judge the credibility of a source. These statements are supported by previous observations. Inference is divided into interdependent skills such as deduction and induction. Advanced clarification is the definition of terms and the identification of assumptions. Strategies and tactics have two skills: "deciding on an action," which includes steps inherent to the process of problem solving, and "interacting with others" in presentation, written text, discussions, and debates.

### **Classroom Management**

Classroom management is the process in which teachers and students create an effective environment in a very decent way to maintain the discipline and inappropriate ways students behave in the classroom. In this way, every student can collaborate with the teachers. The main purposes of implementing the classroom management strategies are to enhance social attitudes and increase students' academic performance and abilities (Emmer & Saborine, 2015; Everston & Weinstein, 2006).

### **Student Attitude**

Attitude means conduct or carrying out oneself; attitude is what we do, especially in response to outside stimuli. There are two types of attitude:

#### **Positive Attitude**

Positive attitude, which includes an exceptional work ethic, excellent manners, class leader, classroom helper, positive role model, excellent academic student, demonstrates great concern for school, participates in school activities in an appropriate manner without causing disruption in the classroom, respects their teachers, and follows the rules and regulations

#### **Negative Attitude**

Myers, 2003, defines the negative attitude of the students as overt and covert. Overt attitude is more open and observable and would include students talking during class, using their cellular phones, eating or drinking noisily. Covert attitudes are more passive and include sleeping during class, arriving late to class, leaving class early, or generally acting bored and disengaged.

## Positive Classroom Environments

A positive classroom environment is an environment in which to promote positive peer relationships and develop classroom rules and regulations in which to maintain the maintenance of discipline.

### Aims of the research

To determine the effects of student engagement in mathematics on critical thinking skills. To examine the tasks and strategies which teachers use to encourage critical thinking skills and student engagement.

### Research Questions

The following statements are observed as research questions:

What are the specific tasks and strategies that teachers use to encourage critical thinking and student engagement in their classroom?

What are the challenges teachers' faces in encouraging critical thinking in the secondary classroom?

Which factors have that effect on student engagement and critical thinking skills?

### Statement of the problem

Engagement is the incorporation of behavioral, cognitive, and affective engagement. It depends on thoughts, behaviors, and actions. Critical thinking refers to the level of thinking skills and mathematics focuses on reasoning. The statement of the problem is "Relationship between Students' Engagement in Mathematics and Critical Thinking Skills at Secondary School Level".

### Research Methodology

Action research is used for interference because it can guide the investigator to recognize superior the difficult and actual circumstances which is more suitable than exploratory perspective. It is not just help to document, acknowledge and explain the all educational aspects but also alternate and upgrade educational implementation and chances. It can help educators, instructors, colleagues and collaborators to educate the learning surroundings which require to collecting details about the ways in which teacher teaches and student learn. It conduct well designed interference so it gives the chance for educators and investigators and other collaborators for corporation that help them to be actively implicate in actual context. The primary source of data collection for this research study came from interviews. The interviewees were experienced educators in Lahore. There was flexibility in the construction of the interview and report was developing between me and interviewees by using interviews to collect data. There was a list of 09 interview questions was constructed in preparation for the interview process. Researcher asked the questions from the participants that deal with their understanding of critical thinking, what are their believes according to student engagement looks like in the classroom, their personal philosophies, which strategies that they used in classroom to enhance critical thinking skill, what are the possible challenges they face in term of implementing critical thinking. Purpose of this research study, participants was interviewed individually and face-to-face. The interviewed lasted approximately 25 minutes each. They were recorded digitally using an audio recorder. Sampling technique is specifying how elements are drawn from the population. Ten teachers of these schools were taken as a sample. Sample was collected through convenience sampling technique because schools were selected by convenience of researcher. The researcher collected recorded interviews from 18 expert mathematics teachers. They taught at secondary level. They were from different school of district Lahore. In order to this research study, participants were those who had all the knowledge on the topic of critical thinking. They were implemented this methodology in classroom on daily basis. It was compulsory for the participants to be current faculty member within a secondary school. I chose to interview an experienced classroom teacher.

The researcher had a very professional relationship with research participants, and had the opportunity to observe educators teaching programs prior to this study. I was confident that their beliefs and experiences regarding this topic. Before interview process I took permission from participants. They were agreed to indicate their willingness to participate and contribute in the research study. Participants were also assured that their identities would remain anonymous throughout the research study and that the information would be kept confidential. Participant kept a copy of the consent form for their records.

## Results

### Question no 1: What does critical thinking mean to you?

According to all of respondents critical thinking is reasoning judgment and evaluation of communication and observation. It is actually the ability of understanding the ideas, solve the problems by thinking deeply. In this we think critically about any situation or any content problem. We clear the concept and reach to a conclusion. Some responses are as below:

1. *Critical thinking known as logical evaluation which is reasoned and thoughtful out. It is styles of thoughts in which you don't directly receive all logic and interpretation you are showed to act rather have a point of view demanding questioning like reasoning and interpretation. It needs deficient to see what verification is complicated to assist specific reasoning or interpretation.*
2. *Analysis of any issue or problem for sake of making a judgment is critical thinking.*
3. *Critical thinking is to do analysis of any issue or topic. To examine it analytically and critically and develop your opinion about the topic.*
4. *Critical thinking known as to take a logical evaluation which is reasoned and thoughtful out. It is a style of thought in which you don't directly receive reasoning and interpretation. You are showed to act rather have a point of view demanding questioning like reasoning and interpretation.*
5. *Critical thinking is a process by which student critically analysis the situation by their own reasoning and then explain it.*
6. *Critical thinking is the thinking process which make to a person to take decision.*

### Question no 2: What is your own philosophy regarding the use of critical thinking in the classroom?

In this question everyone describe their own philosophy. They presented that critical thinking plays a vital role in classroom for student learning. Teachers follow the weaknesses of the students and then motivate them to take positive achievement. It helps to clear the concepts more easily and understand the things more deeply. Due to critical thinking they can easily generate their ideas by using previous knowledge. It helps to solve the real life problems. Logical reasoning is very effective in student ongoing learning.

1. *Mathematics is a topic in which pupil are frequently present in case of logical thinking by using mathematical evidence way. Even numerous mathematician works for this chance to present introduce pupil to concepts of logical conclusion, build a new logical influencing logic (the primary mode of reasoning used un science?) similarly, projects requiring instructional study and argumentative write down issues which perfect chance to present pupil in college writing classes to logical reasoning (in which verification the form of premises of an argument) guide an ending and how those logic can be try out for reasonableness, rationality, power and faults.*
2. *In class room critical thinking can motivate the students but i ensure that my students take the criticism positively.*
3. *The philosophy of critical thinking in the classroom is that we must given time to students to think critically. They will be prepared for long term future. They will be logic and rational with their ideas.*
4. *In classroom, critical thinking plays a very vital role. It helps understand things more deeply and clear the concepts more easily. The level of understanding in students enhances which is the major requirement inside a classroom.*
5. *I would like to analyze the students thinking and problem then find a conclusion.*
6. *In classroom I use to follow idealism.*

### Question no 3: Which is the best method do you use to stimulate critical thinking in your student?

Critical thinking is not just a skill for learning. It is used in life. This skill is very necessary during teaching method. In mathematics to stimulate the student by using practical work method. As they practice they learn more and more, because practice makes a man perfect. Give them some open ended questions. In this they use their mind and cognitive skill. Different tests, activities, quizzes are include student to understand the concept in better way. Majority of them were agreed that demonstration method, experimental and practical method were best to stimulate critical thinking in the student. Some of them said to give them respect and love, encourage them and take good result. The responses are:

1. *To teach the critical thinking abilities is compulsory for all pupils because they are spending an important living way. Such as all teachers are looking for delighting ways join the students in classroom. Critical thinking I not just a learning skill. It is more than it. It is a skill for life. It is an ability which everyone can use in the classroom or out of it. Partners of critical thinking are perfect guider for learning. They know how to think critically and a lot of fun about it.*
  2. *I allow my students to debate on different issues.*
3. *The best method I use in the classroom of critical thinking is doing practical work. More practical work more critical thinking because students can learn from experiments.*
4. *I always involve some brainstorming activities, quizzes, tests ect which include student in better thinking and understanding.*
  5. *To give them respect and love.*
6. *The best method to create critical thinking in students is to give them a topic and let them free to think about it and give their opinions on that topic.*
7. *There are five techniques that stimulate critical thinking are*
  - I. *Use analogies*
  - II. *Promote intervention among students*
  - III. *Ask open-ended questions*
  - IV. *Use daily life problems*
  - V. *Allow for thinking practice*

#### **Question no 4: What is the positive impact of critical thinking on student achievement?**

There are different positive impacts of critical thinking on student achievement like it builds their confidence and motivates them to solve problems positively. It booster the abilities and fostering the skill to tackle academic tasks and gathering information introducing their ideas and then indicating on them. Student start understanding and thinking about all the complexities of a topic and understand them by using deeply thoughts. It gives self-motivation and creates confidence. It encourages students. They use all the work by using real life problems not coping the things and clear all the concepts. It improves their learning skill and enhances the knowledge. Students complete every task without any nervousness and give better academic achievement. The answers of respondents are:

1. *With it students are able to think vast and can do their best and may show good performance.*
2. *It builds their confidence and motivates them and also it helps them to deal with different situations positively.*
3. *Critical thinking is at the heart of unlock, it also booster the ability and promoting the skill and methods which students need to handle educational tasks when collecting and evaluating information, arranging and introducing their plans, and then indicating on them.*
4. *The impact of critical thinking is always positive in students as students start understanding and thinking about complexities of a topic and understands deeply. Then the result of their learning will also be positive.*
5. *They can solve their problems easily, achieve effective management and a critical mind set for every situation.*
6. *The students can take decisions in their daily life and can easily interact with the other person. And they can also improve their academic success.*

#### **Question no 5: when you utilized critical thinking strategies what effect did it have on student engagement in your teaching experience?**

Teachers use different critical thinking strategies and pedagogical skills to engage the students in their teaching. It depends on the performance of students. It allows to all possible facts and also explores things with different angles. Enhancing critical thinking skill in students has a knock-on result in upgrading issue resolving skill, opens, imagination and organization, arrangements and making the correct choices in life. The students improved their creativity and innovation levels increase too. Students get engage in instructions and listen everything carefully. Teachers give them real- life problems to motivate and encourage them. Ask previous knowledge and move around the classroom to observe every student. Activity based learning is a great strategy. Student participation has great effect on engagement.

1. *It may totally depend on the performance of students and accordingly where needed different strategies may use.*
2. *Critical thinking allows students to use their minds and think about all possible facts and also it allows them to explore things with different angles.*
3. *Good critical thinking outcomes in the skill to produce the correct evaluation more often. Enhancing critical thinking skill in students has a knock- on result in upgrading issue resolving skill, honest, imagination, arranging, arrangements and making the correct choices in life.*
4. *Whenever I use any critical thinking strategy, it effects the overall result of my class. the feedbacks I get are very satisfactory only by adding some critical thinking strategies and activities in my lectures or teaching, the students learning improved and their creativity and innovation levels increase too.*
5. *Students engaged more and more and their responses are positively.*
6. *While using strategy of critical thinking students get engage in instructions and listen everything carefully.*
7. *We should set clear learning goals, make learning convenient for students and create open communication task.*

**Question no 6: What do your opinion about student engagement?**

Student engagement plays a vital role in students' life. There is little different point of views about student engagement. In education it gives the level of awareness, interest, attentiveness, confidence and passion which pupil show when they learned or taught that enhance the motivational level. They have to learn and showed their success in academic. Student engagement has predicted on the confidence which improved student's curiosity, interest or motivated during learning. Passive learning doesn't result in good understanding as compared to active learning. Teacher should be soft and show friendly behavior. How much student show their interest and motivated. It is based on the constructivist assumption that learning and individually participation intellectual ability.

1. *In education, it gives the level of awareness, interest, attentiveness, confidence and passion which pupil show when they learned or taught that enhance the motivational level. They have to learn and showed their success in academic. Student engagement has predicted on the confidence which improved student's curiosity, interest or motivated during learning.*
2. *Student engagement is very important in classroom and a teacher must know how to engage the students in learning. I as a keep try to keep my students engaged in classroom.*
3. *Student engagement has enlarged admiration. It enhance the understanding level which determined cognitive, spiritual, observable, physical and environment factors which effect on the process of learning and social development.*
4. *Student engagement is very important because doing and learning is the key of learning. Learning through experience is the best way of learning and understanding something. Passive learning doesn't results in good understanding as compared to active learning.*
5. *Student engagement is teacher should be like a friend and soft behavior then student engage more and more.*
6. *Student engagement is very important in their study. If they pay attention to instructions given in class they work better in assessments.*

**Question no7: How does student engagement look in your classroom?**

Student engagement looks in the classroom in different ways. Students are morally and good respond in the positive way. Everyone are given time to think about the ideas and logics. They learn through some sort of activities or group



activities. Demonstration and activity method is best to see the engagement. Students are monitor by the teacher. They follow to the rules and norms. They display behavior relationship with determination and awareness. Show interesting way of teaching to motivate them. Students don't miss lecture. Some teachers write topics name on the board and also write some helping words from which student select one topic and write the help of helping words. They just think about the topic and recreate the new idea. Students participate actively and response on the lecture which they received.

1. *Getting all your students focused, eager, and on task at the beginning of class is challenging enough*
2. *In my class room i keep my students engaged in different activities related to their studies.*
3. *The student engaged in my classroom is very interesting. Students are morally and good and respond in the positive way. Everyone are given time to think about the ideas and logics.*
4. *In my classroom, the students are always learning through some sort of activities or group activities. I prefer teaching with examples, demonstration and activities. I believe that experiments and experience is very important for students to learn something*
5. *In my classroom all student engage through question answer.*
6. *Student engagement level is high in my classroom as I monitor them while delivering lecture.*

**Question no 8: Which is the best method to enhance student engagement?**

There are different methods to engage the students in the classroom. Majority of them were agreed on demonstration, activity and practical method. Some were agreed on project based learning, question answer method, collaborative learning etc.

1. *To give them enough tasks rather than make sit them free.*
2. *Active learning method and participatory approach*
3. *The best method to enhance student engagement is individual respect. Once the chance is giving to everyone for critical thinking, each one will be engaged and think.*
4. *Demonstration method is the best method to enhance student engagement in the classroom in my opinion. And group activities play a vital role in this regard too.*
5. *Friendly behavior.*
6. *Discussion method*
7. *Crate learning that is active, collaborative and fosters learning relationships.*
8. *Critical thinking and activity.*

**Question no 9: Is there any positive relationship between student engagement and critical thinking?**

Yes, there is a positive relationship between student engagement and critical thinking skill. If students are taught that they should take the criticism and critical thinking in positive and constructive way. When students are engage in the classroom then obviously they will think critically but it depends on teachers. One can achieve better with critical thinking and some related strategies. When teacher understand the problems of students and thinking of students then teacher they develop more.

They pay attention on the lecture they develop more critical approach. They search the topic from different websites and rewrite it in their own words and think critically which is good for them. The students who learn broadly and critically have more knowledge and ideas then others. They apply in real-life situation and get experience. Participants are big advocates of critical thinking, as they feel that it has a strong positive impact/ relationship on student engagement.

1. *Yes with this they can built self made stuffs and may think more effectively.*
2. *There can be a positive relation if students are taught that they should take the criticism and critical thinking in positive and constructive way*
3. *Yes, there is positive relationship between student engagement and critical thinking, when students are engaged in the classroom then obviously they will think critically but it depends on teachers he/she is handling everything with critical thinking. When the students will be engaged then they have time to think.*

4. *Yes, there is very strong relationship between student learning and their critical thinking. One can achieve better with critical thinking and some related strategies.*
5. *Yes, there is a positive relationship between student engagement and critical thinking because when teacher understand the problems of students and thinking of students then teacher easily engaged the student.*
6. *Yes, there is positive relationship between student engagement and critical thinking. As they pay attention on the lecture they develop more critical approach.*
7. *Yes, there is positive relationship between both of them.*
8. *Yes, both are engaged with each other. Positive thinking help students to resolve questions easily.*

**Question no 10: what are the challenges that teachers face to encourage critical thinking skill in secondary classroom?**

1. *Parents concerns*
2. *Lack of teacher training*
3. *Student hesitation*
4. *Lack of time*
5. *Parental involvement*
6. *Analytical thinking*
7. *Misunderstanding*
8. *Lack of teamwork*
9. *Not enough time to plan*
10. *Parents time*
11. *Time is limited*
12. *Lack of resources*
13. *Environment involvement*
14. *Classroom management*
15. *Student involvement*
16. *Teaching method*
17. *Thinking level*
18. *Lack of motivation and attention*

In this question everyone describe different challenges that teachers face during classroom. Some were agreed on classroom setup, parental involvement, lack of time, student involvement, teaching method, thinking level, lack of teamwork etc.

### **Discussion**

#### **Question Answer**

Participants mentioned effective and open-ended questioning is very useful strategy to promote critical thinking among students. Due to open-ended questioning students use their critical thinking skill. In mathematics teachers clear the concepts of the students and give them questions from outside the book so, this questioning will be effected. If student ask any questions so teacher should encourage them and give the answer or solve the problem. We should give many opportunities to think deeply and critically on daily basis to the students. Teacher should not present his student with pre-packed information but focus on solving problems by using critical thinking.

#### **Classroom setup**

Participants describe that how they can see critical thinking or implementation of critical thinking in the classroom. Teachers give the opportunity to the students to participate in the classroom. Teacher should just like facilitator not like a master of knowledge that always stands at the front of classroom. Students show active learning in their study. Teacher observes the students, check their problems and solve them. Teacher should create an environment that supports thinking and learning. Classroom setup consists on group of desks then students can talk and discuss the concepts among themselves. Good critical thinkers typically extend their knowledge, test their ideas and beliefs.

### **Student engagement**

All of participants are big advocate of thinking has positive impact on student engagement. Teachers focus on student previous knowledge and then transfer the knowledge according to that. In student engagement the role of open-ended questions are very much important. Teachers can't change curriculum but they can change the delivery method of curriculum. When teacher engage the students they become involved in their learning process. Teachers give them different resources for learning and engage them with motivation, encouragement, positive reinforcement etc.

### **Teacher engagement**

Participants admitted that teacher engagement is also important to engage the student. Teachers can enhance their own engagement when they use critical thinking skill in their teaching practice. Teachers should always give strong positive answers to the students that show teacher engagement. Students are the mirror of teacher. They show the engagement during the lecture in the classroom.

### **Student achievement**

Critical thinking has positive effect on student engagement. Every participant have their own believes. Student engagement and critical thinking both have positive effect on academic achievement. Classroom test, exams, student behavior, curricular and co curricular activities are the part of student achievement.

### **Increase in higher- order thinking**

Teacher gives brainstorming questioning in which student can move forward and expands the knowledge by thinking. School administration also worked on student thinking skill and enhance their learning and academic achievement. Critical thinking is also including in higher- order thinking. Students can solve everyday problems easily. They can increase their thinking level to their motivation and student involvement in the classroom. Student curiosity and stamina also show their thinking level. Teachers can engage the students in learning to increase their interest, enjoyment to fulfill their personal goals. Due to higher- order thinking they can show a meaningful learning.

### **Critical thinking helps to fulfill the needs of students**

Critical thinking fulfills the needs of students in the classroom. Students face many problems during classroom like misunderstanding, lack of concentration; time management etc and they can solve them by using critical thinking skill. Critical thinking challenges may be give an opportunity to the students to approach the learning with different ways. It has a great impact on learner. Students can show their participation in classroom.

### **Lack of teacher training**

Some time teachers are not willing to deliver the lecture. Teachers use all old method to transfer their knowledge by using the curriculum. Teachers are not willing to adopt new style of teaching that should be more effective engaging way to teach the curriculum. Some teachers want to implement it in the classroom but they don't know how to implement it in the classroom. Some of them have no resources to use new method. Every experienced teacher is not trained in critical thinking.

### **Student hesitation**

Student hesitation is also a challenge. Students have knowledge but they can't transfer it just due to hesitation. They always show blank faces during classroom. Critical thinking is not a challenge but implementation of critical thinking is a great challenge for teachers. Teachers can remove students' hesitation by using encouraging and engaging strategies.

### **Parental involvement**

Parental involvement plays a vital role in student engagement. In the custody of parents students can learn easily. When parents show their involvement students can learn new skills and understand the things easily. Parents concern always shows in students' grade.

### Recommendations

After the study on critical thinking and student engagements it is recommended that

1. Critical thinking should be the part of teacher training.
2. Administration provides all the sources to implement critical thinking in classroom at secondary level.
3. Teachers should work to develop the student's abilities in critical thinking on mathematics.
4. Teacher should provide regular and timely feedback to students in form that make it clear what actions individuals can take to make further mathematics progress.
5. Teachers should focus on different teaching methods. And should use new strategies to encourage the students.
6. Teacher should develop a clear understanding about mathematics and to encourage the students to participate in mathematics.
7. Understand when instructional methodologies need to vary to accommodate differences in student learning needs.
8. Teacher should arrange weekly critical activity of mathematics in classroom to develop the interest and engage in the student of mathematics.
9. Teacher should create a comfortable classroom environment in which all students are engaged, challenged and feel safe to take risks.
10. Teacher should understand and diagnose students' misconceptions/misunderstanding about mathematical engagement.

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