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**DIFFERENT TEACHING STRATEGIES IN MATHEMATICS IN  
DEVELOPING THE CRITICAL THINKING AND PROBLEM-  
SOLVING SKILLS AMONG STUDENTS**

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**ABSTRACT**

The purpose of the study was to investigate and determine the different teaching strategies in Mathematics in developing the critical thinking and problem-solving skills among students of San Jose National High School for the school year 2021-2022. The respondents used in this study were the 35 teachers under online learning and blended learning modalities. Based on the survey, (1) lecture (35 teachers or 100%), problem solving (21 teachers or 60%) and inductive (19 teachers or 54%) method of teaching are the top three teaching strategies that were used by the Mathematics teachers of San Jose National High School; (2) problem solving (15 teachers or 43%) was the most used teaching strategy that developed the critical and problem solving skills of the students, followed by collaboration (6 teachers or 17%) and discovery approach (5 teachers and 14%); (3) Google Meet (12 teachers or 34%), Google Classroom (12 teachers or 34%) and Jamboard (10 teachers or 29%) were the top three ICT applications that the teachers used to make these teaching strategies more effective to address the needs of the students in blended learning modality and (4) appropriate LAC sessions, mentoring and coaching can be done to assist the teachers and help them improve their teaching strategies.

**Keywords:** *teaching strategies, mathematics, problem – solving skills, critical thinking skills*

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## Introduction

Teaching in this modern period is increasingly becoming more complex and technical to be effectively actualized with traditional tools alone. Over the years, teachers' teaching styles have changed significantly. Education for the modern world requires more than transmitting knowledge. Teachers should have deep subject knowledge, but they also need to develop a rich repertoire of teaching strategies which include direct instruction to the whole class, guided discovery, group work, supporting self-study, and individual inquiry.

According to DepEd Memorandum 356, Series of 2010, teaching and learning for understanding is a transformation but very systematic approach to 21<sup>st</sup> century Mathematics education which many of our Mathematics teachers and students will surely welcome. It will provide our students a solid foundation and a strong transition from school to work and from school to life. An effective teacher constantly renews himself or herself as a professional in his or her quest to provide students with the highest quality of education possible. This teacher has no fear of learning new teaching strategies in lessons.

Having said these facts, teachers should think of alternative ways of teaching the students in a more comprehensive way despite the distance learning modality that we are using at present.

Based on the summary of the IPCRF Rating of the Mathematics teachers of San Jose National High School for School Year 2021 – 2022, the top 3 bottom indicators that the teachers got the lowest ratings are as follow: 1. Applied a range of teaching strategies to develop critical and creative thinking, as well as other higher - order thinking skills; 2. Displayed proficient use of Mother Tongue, Filipino and English to facilitate teaching and learning, and 3. Adapted and implemented learning programs that ensure relevance and responsiveness to the needs of all learners.

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This research study will be focusing on the different strategies of the Mathematics teachers to address the needs of students to develop their critical and creative thinking as problem solvers.

Teachers, therefore, need to apply teaching strategies that would help students engage in higher-order thinking tasks such as analysis, synthesis, and evaluation; Study ideas, solve problems and apply what they have learned; Construct hypotheses and make decisions; Provide meaning and organization to experiences; Work collaboratively with others; Connect real-life work between school and what will take place in the rest of their lives and address cultural influences and individual learning styles.

It is in this light that this study is being proposed. It aims to fully find out the different strategies of the Mathematics teachers used in teaching to help students develop critical minds and become problem solvers.

## Materials and Methods

This action research determined the different teaching strategies in Mathematics that the teachers in San Jose National High School used to develop the critical thinking and problem-solving skills among students during the school year 2021 – 2022. The respondents used in this study were the 35 Mathematics teachers from Grade 7 to Grade 10. The researcher asked the assistance of the classroom observer to gather pertinent data regarding the teaching strategies of teachers during classroom observations. The researcher conducted also an online survey for the Mathematics teachers about the different teaching strategies that they used in teaching Mathematics among their students.

The method of research used in the study was the descriptive type which is the most

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widely type of educational research. According to Hall (2014) descriptive method of research design helps researchers plan and carry out descriptive studies, designed to provide rich descriptive details about people, places and other phenomena. This type of research is often associated with anthropology, sociology and psychology, but researchers in other fields, like in education, use it. Descriptive method often involves extensive observation and note-taking, as well as in-depth narrative. Because it does not lend itself to in-depth analysis or hypothesis testing, some researchers regard the descriptive method as unscientific. However, a descriptive research design can serve as a first step that identifies important factors, laying a foundation for more-rigorous research.

## Results and Discussions

The following discussions of results are anchored on the research questions:

### Problem No. 1

What different strategies do the teachers apply in teaching Mathematics?

Teaching Strategies	Grade 7	Grade 8	Grade 9	Grade 10	Total
Lecture	9	9	9	8	35
Inductive	4	5	4	6	19
Deductive	6	5	2	2	15
Heuristic/ Discovery	2	3	1	1	7
Analytic	2	3	2	3	10
Problem Solving	6	5	5	5	21
Project Method	1	1	1	0	3
Collaboration	4	4	3	4	15
Exploratory	1	0	0	0	1
<b>Total No. of Teachers</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>8</b>	<b>35</b>

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Based on the table, Lecture method got the highest number of teachers which is 35 out of 35 or 100% of the teachers used it in teaching Mathematics among students; followed by Problem Solving method used by 21 teachers or 60%; Inductive Method with 19 teachers or 54.29% of the teachers used it in teaching; Deductive and Collaboration method with 15 teachers or 42.86%; Analytic method with 10 teachers or 28.57%; Heuristic or Discovery method with 7 teachers or 20%; Project method with 3 teachers or 8.57% and Exploratory method with only 1 teacher or 2.86%.

Mathematics teachers of San Jose National High School used a mix of teacher-centered and student-centered teaching methods to balance the input coming from the teachers and the students. Most of the teachers used lecture type of teaching, problem-solving, inductive and collaboration method to ensure that the learning of the students will not be compromised.

### **Problem No. 2**

What specific teaching strategies help develop the critical thinking and problem-solving skills of the students?

Teaching Strategies	Grade 7	Grade 8	Grade 9	Grade 10	Total
Problem Solving	3	3	5	4	15
Analytic	1	1	0	1	3
Heuristic/ Discovery	2	1	1	1	5
Inductive	0	1	1	0	2
Collaboration	3	3	1	2	9
Deductive	0	0	1	0	1
<b>Total</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>8</b>	<b>35</b>

Based on the table, problem-solving method has only 15 teachers or 42.86% who used it to help developed the critical and problem-solving skills among students; followed by collaboration method with 9 teachers or 25.71%; Heuristic or Discovery method has 5 teachers or 14.29%;

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Analytic method with 3 teachers or 8.57%; Inductive method with 2 teachers or 5.71%; and Deductive method with only 1 teacher or 2.86% of the teachers used it to develop the critical and problem-solving skills of students.

Only 42.86% of the Mathematics teachers of San Jose National High School used problem solving method in teaching the students that develops the critical thinking and problem solving skills of the students. If the teachers used problem solving method, they also used metacognition as a strategy to help students appreciate that Math helps them to become problem solvers.

On the other hand, only 25.71% of the teachers used collaboration. This method is supported by Calder et.al. (2021) who mentioned that the current world crisis of COVID-19 has enforced international lockdowns in educational institutions, necessitating that these institutions quickly transition to online learning. In mathematics education studies, where collaborative problem-solving is considered a necessary pedagogical approach, lecturers have had challenges incorporating collaborative problem-solving in an authentic manner. To sum it up, problem solving and collaboration helped the students learned Mathematics even they are on distance learning modality.

Only 14.29% of Mathematics teachers used the discovery method. In general, discovery approach involves problem-solving situations that are designed to encourage a student to discover the answers without direct instruction from the teacher. The goal of discovery-based math is to make it more meaningful for children.

### **Problem No. 3**

What particular ICT applications contribute to the effectivity of the teaching strategies to address the needs of the students in blended learning modality?

<b>ICT Applications</b>	<b>Grade 7</b>	<b>Grade 8</b>	<b>Grade 9</b>	<b>Grade 10</b>	<b>Total</b>
Google Meet	3	4	3	4	14
Google Classroom	3	3	4	2	12

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Jamboard	3	2	2	2	10
Total	9	9	9	8	35

Based on the table, 14 teachers or 40% used the google meet for class discussion and consultation; 12 teachers used the google classroom or 34.29%; and 10 teachers or 28.57% used the Jamboard to make their teaching strategies effective to address the needs of the students in blended learning modality.

The use of different ICT applications can help the teachers relay the concept of Mathematics to the students as they enjoy learning Mathematics.

Google Classroom was the most widely used online learning system during asynchronous classes, while Google Meet was a meeting platform during synchronous scheduled classes. These online applications really helped the students' skills towards online learning systems and meeting platforms to become proficient.

The use of Jamboard application as an innovation in teaching word problems to learners was a big help for them to feel that they were like inside the classroom and the teacher used the whiteboard to show the step-by-step solution of a certain word problem.

### **Problem No. 4**

What intervention can be developed to improve the teaching strategies of the teachers to develop the critical thinking and problem-solving skills among students?

Focused group discussions (FGD) and Learning Action Cell (LAC) sessions that will focus on the different teaching strategies including the integration of different ICT applications in the lesson plan of the teachers can be done to assist the teachers and help them improve their teaching strategies to help the students develop their critical and problem-solving skills as they learn lessons in Mathematics. Crafting of lesson plans that include the use of different ICT

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applications will be another form of intervention to make the teaching strategies more effective to address the needs of the students in order to learn.

## Conclusion

Mathematics teachers of San Jose National High School use different teaching strategies in delivering the lessons to students. Some of the teaching strategies develop the critical thinking and problem-solving skills of the students such as problem-solving approach, collaboration, analytic, discovery, inductive and deductive way of teaching. Unfortunately, only few Mathematics teachers use the most effective way of developing the critical thinking and problem-solving skills among students which is the problem-solving approach. Further, analytic, collaboration and discovery approach were used by at most 25% of all Mathematics teachers of San Jose National High School. Mathematics teachers should be given technical assistance in using these effective teaching strategies through Learning Action Cell (LAC) sessions, Focused-Group Discussions ((FGD), Classroom Observations and In-Service Trainings to empower their capacity to teach Mathematics to students such that the students can be able to develop their critical thinking and problem-solving skills. Mathematics teachers should understand that it is necessary for preparing school students to face complex interpersonal and academic problems. Students who learn problem-solving skills often have a deeper understanding of causality. When children solve problems individually or in a group, they become more resilient. In Teaching Through Problem-solving (TTP), students learn new mathematics by solving problems. Students grapple with a novel problem, present and discuss solution strategies, and together build the next concept or procedure in the mathematics curriculum (Lewis, Catherine et. al. 2022)

The integration of ICT application is a great help for the teachers to address the needs of the students to understand more the lessons and enjoy learning Mathematics at the same time.

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These ICT applications involve different teaching strategies that can develop the critical thinking and problem-solving skills among students even they are in distance learning modality.



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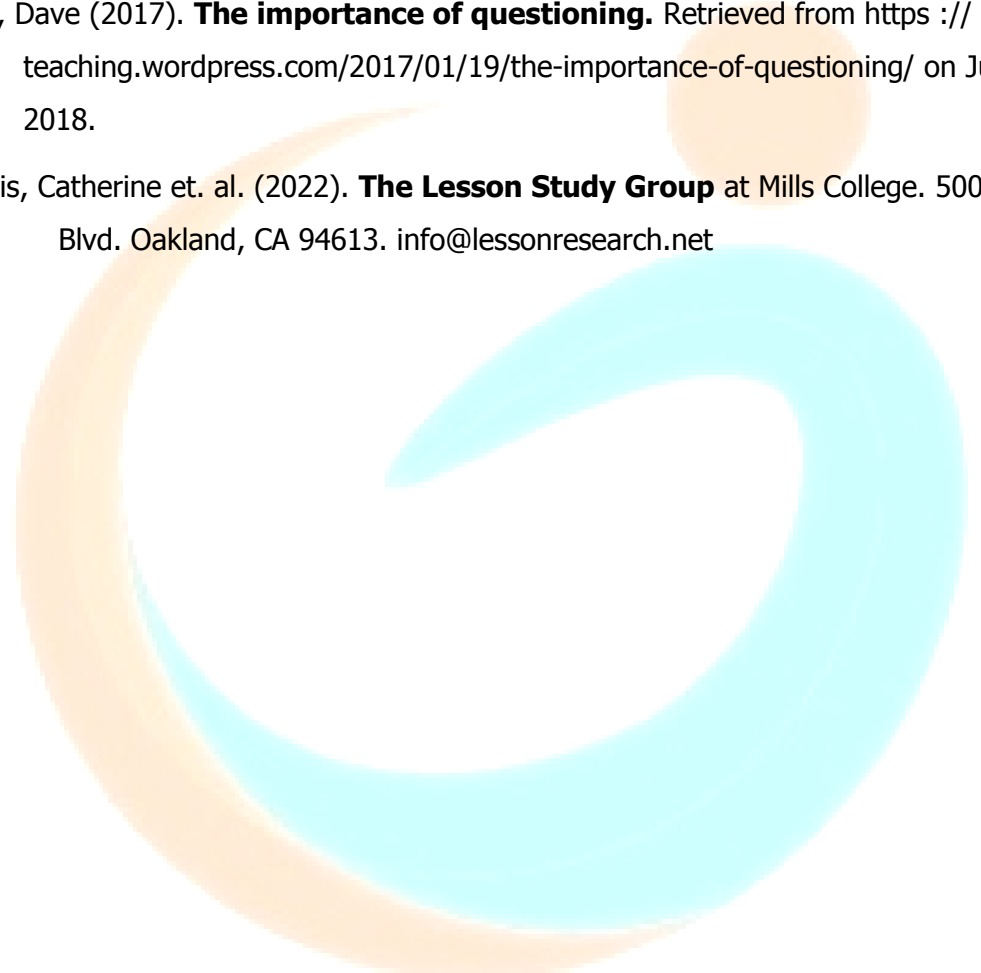
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