



# Evaluation of Student Engagement in the Mathematics Camp

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## ABSTRACT

Student engagement refers to learners' meaningful involvement throughout the mathematics learning camp. It is best understood as a collaboration among students, teachers, peers, and the learning activities. The Mathematics Learning Camp was conducted to improve students' achievement in and interest toward mathematics. This study investigated the learning outcomes obtained through students' engagement during the camp. A descriptive qualitative research design was used. Purposive sampling was applied to select the student participants: sixteen Grade 8 students who attended the mathematics camp, eight of whom volunteered for the interview. Semi-structured focus group interviews were undertaken to elicit participants' perspectives on their experiences during the camp. The interviewees included eight students, three females and five males. These students were interviewed in order to describe their experiences during the camp. The researcher also recorded class observations to gather more information about student engagement in class. A survey and an open-ended questionnaire were likewise used to collect data for analysis. Content analysis was conducted on the interview transcripts in order to uncover common themes and further analyze the data. Results from the achievement test were also obtained to support the qualitative findings. The findings show that the students enjoyed learning mathematics during the camp, as evidenced by their active participation in class activities and their improvement in the achievement test. Overall, the student participants were satisfied with the program. Participants also showed interest, enthusiasm, motivation, and a positive attitude toward mathematics after the camp. These outcomes contributed to the program's primary goal and success.

**Keywords:** camp; engagement; learning; mathematics; students

## INTRODUCTION

In today's rapidly developing science and technology, mathematics has become one of the most significant learning areas. It has importance over and above its perceived applications of basic numeracy skills. It plays a significant role in other scientific fields, such as Physics, Engineering, and Statistics. Due to the relevance of mathematics and its applications, it is widely regarded as one of the most essential subjects and a central aspect of every school's curriculum.

However, student achievement in mathematics in the Philippines has yet to reach the necessary level. The Trends in International Mathematics and Science Study (TIMSS) 2019 revealed that Filipino students lagged behind those of other countries in the international assessment for mathematics and science (Magsambol, 2020). This instance demonstrates that there are particular issues with mathematics education in the Philippines. As a result, the Department of Education (DepEd, 2023) launched the National Learning Camp (NLC), with mathematics as one of its core components, to engage students, boost their involvement, reduce learning loss, and improve learning outcomes.

Noorani et al. (2010) discussed their experience conducting a mathematics camp with 16-year-old students. The camp included various hands-on activities in small groups carried out outdoors in a very relaxed and light-hearted atmosphere. The activities were designed to introduce numerous mathematics topics, such as group theory and number theory, as well as their significance to daily life. Overall, students were pleased with how

the mathematics camp was conducted, believing it was beneficial and helped them enhance their mathematical skills and knowledge.

Furthermore, the mathematics camp has been selected as one of the academic intervention choices for students to increase their mathematical knowledge, skills, and results while enjoying wonderful and exciting outreach experiences. Previous research has found that mathematics camps enhance students' attitudes toward mathematics, promote social skills, and motivate them to comprehend and appreciate mathematics (Ling et al., 2009).

This study is framed by the multidimensional conception of student engagement advanced by Fredricks, Blumenfeld, and Paris (2004), who characterize engagement as comprising three interrelated dimensions: behavioral engagement (participation and involvement in academic activities), emotional engagement (affective reactions such as interest, enjoyment, and attitude), and cognitive engagement (investment of effort in understanding and mastering content). Because engagement is held to be malleable and responsive to contextual features, it is well suited to examining how a learning camp influences students' involvement and disposition toward mathematics. This framework is used to organize and interpret the present findings.

### **Research Objective**

This study aims to investigate students' experiences in mathematics class during the conduct of the National Learning Camp. Specifically, this study sought to:

1. examine students' insights about their learning experiences in mathematics during the National Learning Camp 2023; and
2. determine the positive changes that the implementation of the Mathematics Camp contributed to students.

### **METHODS**

This study used a descriptive qualitative research design to determine and investigate students' engagement in learning mathematics during the camp. The study population was made up of Grade 8 students who attended the National Learning Camp. The researcher conducted content analyses of the obtained responses and interview transcripts to decipher the content and common themes. Purposive sampling was applied. The instruments used in the study were researcher-developed interview questions and a questionnaire modified from Ling et al. (2009). The survey instrument consisted of six items rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The pretest was administered at the first session of the camp, and the posttest was administered at the last session by the teacher.

The results of the tests were obtained as evidence of the extent of students' engagement. A modified questionnaire on perception in mathematics (Ling et al., 2009) was distributed and collected during the last session of the Mathematics Camp. Students were also asked to rank the camp activities according to their preferences.

The qualitative phase involved sixteen purposively selected students, eight of whom voluntarily participated in the interview. Semi-structured interview questions were used for the discussion. The interview session was conducted on the last day of the camp. Descriptive statistics were used to describe the quantitative data collected, and the quantitative data were analyzed in support of the qualitative findings.

### **Participants of the Study**

This study's participants were sixteen students from a secondary public school in Iligan City attending the mathematics camp. Of the total number, eleven were males and five were females. The names of the participants were coded as A, B, C, ..., P. The description of the participants is summarized in Table 1.

Table 1. Participants of the Study

Gender	Frequency	Percentage
Male	11	68.75
Female	5	31.25
Total	<b>16</b>	<b>100.00</b>

### Interviews

Among the sixteen student participants, eight voluntarily participated in the interview and were assigned the codes S1–S8. The researcher developed the interview questions and also adapted items from Ling et al. (2009). The scope of the questions related mainly to students’ experiences and involvement in the math camp activities. Students were also asked about their overall satisfaction with the mathematics learning camp. The interview was conducted face-to-face while an identical set of questions was simultaneously handed out to the selected students so that they could read through the items, provide timely comments and feedback, and convey their opinions in detail.

### Data Collection

Data were gathered using the questionnaire and the semi-structured interview questions administered to the study’s participants. The questionnaire was based on the students’ experiences during the math camp. To acquire additional insights into the students’ varied experiences, eight students were interviewed with guide questions about their engagement in class. They were specifically asked about their involvement in the camp activities, their feelings, their cooperation with peers, and their overall satisfaction. The interview questions were patterned on those developed by Ling et al. (2009). The researcher also observed the classes as the students carried out their class activities; however, the observation was not carried out more regularly due to time constraints.

### Mathematics Camp of the NLC

The Mathematics Camp involved students from Grades 7 and 8 and ran for three weeks. Mathematics teachers who volunteered handled the program, carrying out their duties as teachers and facilitators for the whole duration of the camp. The Mathematics Camp involved varied activities, most of which were done in groups. The activities were interesting recreational mathematics tasks related to students’ learning. Prizes were given away to winners during each activity to encourage the involvement of participants. Assessment tests were administered to students before and after the program to identify the effectiveness of the learning camp intervention on the learning proficiencies of participating learners.

### Camp Schedule

The camp spanned three weeks. Students attended school three days each week, every Tuesday, Wednesday, and Thursday. Six sessions were undertaken each day, and each session consisted of 45 minutes.

### Mathematics Creative Activities

The activities conducted by the teachers in the Mathematics Camp were guided by the implementing guidelines of the National Learning Camp. The activities were as follows:

#### Singing mathematics songs

This activity took place in between and at the start of the activities. The main objective was to promote enjoyable mathematics learning. Students were physically, intellectually, and emotionally immersed as they



sang mathematics songs with actions. This activity drew the attention of all participants in the Mathematics Camp.

### **Ice breaking**

The primary goal of the ice-breaking activities was to get students to know their classmates. This practice also helped students develop their interpersonal skills.

### **Recreational mathematics**

Various recreational mathematics activities were conducted, including group activities, modified quizzes, and creative mathematics puzzles. These activities sparked students' curiosity, stimulating their minds and increasing their interest and confidence in mathematics. The activities incorporated mathematical concepts and skills in which students used what they had learned in school. These learning mechanisms indirectly reinforced students' fundamental mathematics skills. They also fostered interpersonal skills through collaborative tasks.

### **Mathematics problem solving**

Students were refreshed on techniques for solving mathematical problems. Drawing a diagram, constructing a table, using the trial-and-error method, and working backward were all offered as methods for solving problems. These activities encouraged students to discuss problem-solving processes and to reflect on the solutions obtained and methods used. Through discussions, students could improve their understanding and gain better insights into the problem. Students were allowed to communicate their ideas through group discussions and presentations.

### **Mathematics quiz with a twist**

This exercise included individual and group quizzes. Tokens and simple food were prepared for winners to encourage students' participation and to make the activity more competitive and exciting. The quiz questions were based on the NLC learning material specifications to test students' basic mathematics skills and general knowledge.

### **Hand-in-hand activity**

This activity was specially designed for students to collaborate with their peers. Participants had to choose their peers to participate in this activity, which aimed not only to foster closer relationships between peers but also to enable them to guide their peers in learning mathematics together.

### **Reflection session**

This session allowed participants to reflect upon their activities in the Mathematics Camp. The participants reflected on their experiences, feelings, and the benefits gained from the camp activities. They were encouraged to share their experiences and what they had learned in the camp through the semi-structured interviews.

### **The Process of Coding**

Although tentative analysis of the evidence occurred through reflecting on and processing the data as they were collected, the analysis of students' understandings of engagement was extended and formalized through coding, categorizing, interpreting, and confirming the data, drawing on the analytic approach described by Goossens (2013). This coding process involved labeling and categorizing participant responses for further analysis and interpretation. More specifically, it involved identifying themes and patterns, classifying all data under these codes, and integrating themes across the responses through triangulation of the primary sources of evidence, as demonstrated in the tables presented.

## Representing the Findings

The data in this study were organized using visual representations, which aided categorization and analysis and served to exhibit engaging and meaningful findings. These visual representations are elaborated in the discussion, where the outcomes of the study are described in narrative form, presenting the participants' understandings and experiences of participation in the mathematics camp.

## Ethical Considerations

Permission to conduct the study was secured from the school administration. Because the participants were minors, informed consent was obtained from their parents or guardians, and assent was obtained from the students prior to data collection. Participation was voluntary, and participants were informed that they could withdraw at any time without consequence. To protect their identities, participants' names were replaced with codes (A–P for the camp participants and S1–S8 for the interviewees), and all data were kept confidential and used solely for research purposes.

## RESULTS

### Students' Experience in the Mathematics Camp

Sixteen students completed the questionnaire given to them after the last session of the mathematics learning camp. Six statements measured students' insights toward their experiences in the Mathematics Camp. For the first statement, "Mathematics Camp activities were very interesting and enjoyable," 100% of the students strongly agreed. The second statement was "Mathematics Camp activities attracted my interest towards Mathematics"; 93.75% of the students strongly agreed, 6.25% agreed, and none disagreed or strongly disagreed. The third statement was "Mathematics Camp activities motivated me to learn Mathematics"; 93.75% strongly agreed and 6.25% agreed, with none disagreeing or strongly disagreeing. For the statement "I am actively involved in the Mathematics Camp activities," 87.5% of the students strongly agreed and 12.5% agreed. For the statement "I like to cooperate with my peers in group activities," 93.75% strongly agreed and 6.25% agreed. Overall, 93.75% of the students strongly agreed and 6.25% agreed that they were satisfied with the Mathematics Camp activities. Table 2 shows the summary of the student participants' responses.

Table 2. Students' Insights on Their Experiences in the Mathematics Camp

No.	Statement	Strongly Agree (%)	Agree (%)	Total (%)
1	Mathematics Camp activities were very interesting and enjoyable.	100.00	0.00	100
2	Mathematics Camp activities attracted my interest towards Mathematics.	93.75	6.25	100
3	Mathematics Camp activities motivated me to learn Mathematics.	93.75	6.25	100
4	I am actively involved in the Mathematics Camp activities.	87.50	12.50	100
5	I like to cooperate with my peers in group activities.	93.75	6.25	100
6	Overall, I am satisfied with the Mathematics Camp activities.	93.75	6.25	100

### Students' Responses Based on the Components of Their Learning Experiences

Students who participated in the interview shared their learning experiences in the math camp along different components. This section focuses on the analysis of the interview and explores the interpretation of what the data indicated about the students' experiences. Although this study focuses on a particular case in a specific



setting, it is intended to create awareness among students that engagement in class activities is essential in learning mathematics.

### **Active involvement**

The first component of the interview concerned the students' active involvement in mathematics during the camp. Unanimously, the participants responded that they took part in the activities, joined the fun-filled games, and had fun. Participants S1, S2, S3, S4, and S5 highlighted this:

*"Participate in the activities."* (S1)

*"Doing homework, study in advance."* (S2)

*"By participating in all activities."* (S3)

*"By participating in the activities."* (S4)

*"By answering and participating in all activities."* (S5)

S6 noted that he also met new friends:

*"I am actively involved and enjoyed the fun-filled games. I meet some new friends."* (S6)

The responses of participants S7 and S8 indicate that their participation in the activities was strongly related to a sense of fun and enjoyment:

*"I did try my best to be a part in all activities. I get to learn and have fun at the same time."* (S7)

*"Yes, I like answering on the board and joining fun-filled games."* (S8)

### **Fun-filled math activities**

The second component concerned the students' experiences during the math activities described in Section 3.6. Based on their responses, the students enjoyed and had fun in the activities, most frequently naming the tangram puzzles, the slope-formula song, and the recreational math games as their preferred activities. Their preferences are summarized in the codes presented in Table 3.

### **Interest toward mathematics**

The third component concerned the students' interest toward mathematics. Based on their responses, the students became interested and motivated to learn mathematics because it was fun and enjoyable. As S1 said:

*"Math is fun. It motivates me to learn more about mathematics, learning more about topics I never known."*

Their positive view toward mathematics was consistent across the other students. As S2 stated:

*"Math is very wonderful, nay mga dula ug solving [there are games and solving]."*

S3 also noted that math is interesting:

*"Studying math is interesting. It motivates me by being competitive."*

S4 shared that math is enjoyable and fun:

*"It was enjoyable and fun. It motivates me by teaching me things I have a hard time learning, and it was enjoyable and fun."*



S5 emphasized that he now loves math:

*“To be honest, I’m not really good at math and hate it but now I really love it because of our kind teacher and singing some songs. It motivates me to be an engineer.”*

S6 was motivated to learn:

*“It motivates me to ask questions and answer our activities.”*

S7 came to view math as fun:

*“I don’t really find math fun, but this summer camp, Math really is fun because of our kind teacher. Our teacher gave us prizes if we got a correct answer so I think that is really what motivated me.”*

As S7 stated, the teacher’s attitude also seems to be an essential part of the students’ interest in learning math, which may reflect the subconscious impact a teacher’s demeanor can have through what they demonstrate and the expectations they communicate to students.

S8 likewise shared his thoughts about learning something new during the camp:

*“I’ve learned new things about mathematics. It is very interesting and enjoyable. Mathematics makes us alive. It motivates me to be confident and answer on the board and join the activities.”*

As observed, students reported a more positive learning experience and engagement during the mathematics camp. These results indicate that the emotional dimension of engagement (Fredricks et al., 2004) is particularly prominent as students reflect on their learning.

### **Cooperation with Peers**

The fourth component was cooperation with peers. Students responded positively, saying that they liked to cooperate in the activities because the activities were fun. S1 mentioned that:

*“Cooperating in groups will make the activity easier.”*

S2 revealed that he likes to cooperate because they understand each other:

*“I like to cooperate kay kami tanan magkasinabot [because we all understand one another].”*

S3 stated a similar thought:

*“I do cooperate by participating in games and activities that the teacher gave us.”*

S4 affirmed this by saying:

*“I cooperate by helping in ways I know I can do.”*

S5 declared a similar thought:

*“I cooperate by listening to them and following instructions.”*

S6 cited that he actively cooperates because it is fun:

*“I cooperate actively in all activities because it’s more fun in the group.”*

S7 and S8 confirmed and answered alike:

*“I don’t really like socializing but this one is fun and I tried to cooperate.” (S7)*



*"I cooperate because it's more fun and they gave a lot of information."* (S8)

These students value being able to experience mathematics meaningfully and concretely. There are also indications of the role enjoyment plays in cooperating with peers; in particular, students' responses suggest that they cooperate when learning is more fun and informative at the same time.

### Satisfaction with the Mathematics Camp

The fifth component was the students' satisfaction with joining the mathematics camp. As reflected in the responses, satisfaction is related to a sense of fun in learning, and engagement is influenced by the relevance of learning for these students. The responses below further indicate students' desire for enjoyable learning and mainly highlight the connection between valuing knowledge and seeing meaning in it. Students also expressed their hope to experience the mathematics camp again soon.

Students S1, S2, and S6 shared similar thoughts about their satisfaction in joining the camp:

*"Very satisfied."* (S1)

*"Yes, very satisfied."* (S2)

*"Yes, so much satisfied."* (S6)

Students S4 and S5 expressed their desire to have another mathematics camp next year:

*"Yes, very satisfied. Hope to attend next year."* (S4)

*"Yes, very satisfied. I hope may next year [I hope there is one next year]."* (S5)

Students S3, S7, and S8 declared that they were satisfied because of the enjoyment the camp brought:

*"I am very satisfied in the mathematics camp because it's very fun and interesting."* (S3)

*"Yes, very satisfied. It was fun and definitely memorable."* (S7)

*"I am very satisfied because I've learned something new and make friends with other students."* (S8)

The responses of the participants above indicate that these students see optimal learning as strongly related to a sense of fun and enjoyment. Their experiences of working with others, playing games, using puzzles, and having fun indicate an environment with rich engagement. In particular, these activities successfully immersed students in learning, engaged them in exciting activities, helped them feel safe to get involved, allowed them to employ their knowledge engagingly, and gave them the appreciation that learning mathematics is fun.

### Students' Engagement Based on Their Learning Experiences in the Math Camp

Table 3 comprehensively summarizes the primary descriptors and related codes generated from student responses about their math camp learning experiences. A significant pattern among the participants is their active participation during the math camp; they found the activities engaging and fun. They demonstrated that attending the math camp piqued their interest in learning mathematics.

Table 3. Themes and Codes from Students' Responses Based on Their Learning Experiences in the Math Camp

Quotes	Codes	Themes
S1. Participate in the activities. S2. Doing homework, study in advance. S3. By participating in all activities. S4. By participating in the activities. S5. By answering and participating in all activities. S6. I am actively	Participating; Doing homework; Studying in advance;	Active Involvement



<p>involved and enjoyed the fun-filled games. I meet some new friends. S7. I did try my best to be a part in all activities. I get to learn and have fun at the same time. S8. Yes, I like answering on the board and joining fun-filled games.</p>	<p>Answering; Actively involved; Joining games</p>	
<p>S1. Competing with other groups, tangrams, solving puzzles. S2. Singing math songs, tangrams, slope formula. S3. Tangrams, slope formula song. S4. Slope formula because solving it was so fun and I learned a lot and enjoyable. S5. When we were playing tangrams and our math songs. S6. Math songs, fun-filled games because I'm enjoying. S7. We did slopes, for me it became easy when we sing it and also fun. S8. The tangrams and slope formula because I learn something.</p>	<p>Competing; Solving puzzles; Singing math songs; Solving the slope formula; Playing games</p>	<p>Fun-filled Math Activities</p>
<p>S1. Math is fun. It motivates me to learn more about mathematics, learning more about topics I never known. S2. Math is very wonderful, nay mga dula ug solving [there are games and solving]. S3. Studying math is interesting. It motivates me by being competitive. S4. It was enjoyable and fun. It motivates me by teaching me things I have a hard time learning, and it was enjoyable and fun. S5. To be honest, I'm not really good at math and hate it but now I really love it because of our kind teacher and singing some songs. It motivates me to be an engineer. S6. It motivates me to ask questions and answer our activities. S7. I don't really find math fun, but this summer camp, Math really is fun because of our kind teacher. Our teacher gave us prizes if we got a correct answer so I think that is really what motivated me. S8. I've learned new things about mathematics. It is very interesting and enjoyable. Mathematics makes us alive. It motivates me to be confident and answer on the board and join the activities.</p>	<p>Motivated to learn; Playing and solving; Interesting; Enjoyable and fun; Motivated to ask and answer activities; Learning new things; Motivated to be confident</p>	<p>Interest toward Mathematics</p>
<p>S1. Cooperating in groups will make the activity easier. S2. I like to cooperate kay kami tanan magkasinabot [because we all understand one another]. S3. I do cooperate by participating in games and activities that the teacher gave us. S4. I cooperate by helping in ways I know I can do. S5. I cooperate by listening to them and following instructions. S6. I cooperate actively in all activities because it's more fun in the group. S7. I don't really like socializing but this one is fun and I tried to cooperate. S8. I cooperate because it's more fun and they gave a lot of information.</p>	<p>Makes the activity easier; Understanding each other; Cooperating by participating; Cooperating by helping; Cooperating by listening and following instructions</p>	<p>Cooperation with Peers</p>
<p>S1. Very satisfied. S2. Yes, very satisfied. S3. I am very satisfied in the mathematics camp because it's very fun and interesting. S4. Yes, very satisfied. Hope to attend next year. S5. Yes, very satisfied. I hope may next year [I hope there is one next year]. S6. Yes, so much satisfied. S7. Yes, very satisfied. It was fun and definitely memorable. S8. I am very satisfied because I've learned something new and make friends with other students.</p>	<p>Very satisfied; Fun and interesting; Memorable; Learned something new; Made friends</p>	<p>Satisfaction with the Mathematics Camp</p>

### Students' Performance Before and After the Mathematics Camp

The next area of interest regarding what the students revealed about their engagement in the mathematics classroom relates to their sense of achievement and its effect, as evident in the data shown in Table 4. A 30-item test was given to the students before and after the conduct of the program, and the scores were obtained and analyzed to determine the effects on the degree of their engagement and to support the qualitative findings of the study.



Table 4. Scores in Mathematics Before and After the Implementation

Learner	Prior NLC	After NLC
A	12	22
B	6	23
C	12	21
D	7	23
E	12	24
F	0	20
G	12	15
H	0	22
I	10	23
J	10	19
K	8	23
L	0	23
M	11	20
N	6	20
O	5	22
P	8	18
Mean	<b>7.44</b>	<b>21.13</b>

As revealed, the mean score of the students before the implementation of the camp was 7.44, which is below the passing score of 60%. This shows that most, if not all, of the students failed the test. After the conduct of the program, the mean score of the students improved to 21.13, which is well above the passing score. This implies that most of the students obtained a score beyond 18 and passed the test.

To determine whether there was a significant improvement in the test scores of students after the mathematics camp program, a statistical hypothesis test was performed, as shown in Table 5. The paired-samples t-test was used on these two sets of related data to investigate whether there was a significant difference between their means.

Table 5. Paired-Samples t-Test of Students' Scores Before and After the Mathematics Camp

Pair	Mean	SD	Mean Difference	t	df	p
Prior NLC	7.44	4.37	13.69	10.16	15	< .001
After NLC	21.13	2.36				

The findings show that at  $\alpha = 0.05$ , the computed t-value is 10.16 ( $df = 15$ ) with a p-value of less than .001, which implies that there was a significant improvement in scores. The mean improvement was 13.69 points (95% CI [10.82, 16.56]). To gauge the practical magnitude of this change, the effect size was computed using the standard deviation of the gain scores (Cohen's  $d_z$ ), yielding  $d_z = 2.54$ , which substantially exceeds the conventional threshold of 0.80 for a large effect (Cohen, 1988). This indicates that the students' engagement in mathematics was associated with a meaningful improvement in their achievement-test scores. As discussed in the Limitations section, however, the absence of a comparison group means this effect cannot be attributed to the camp alone.

It is also worth noting the variation within the gains. While most learners improved markedly—three students who scored 0 on the pretest reached 20–23 on the posttest—a small number showed comparatively modest gains. Learner G improved by only three points (from 12 to 15), and learners C, J, and M improved by nine points each. These cases suggest that the camp did not benefit all students to the same degree, and the experiences of lower-gaining learners warrant closer attention in future studies.

## DISCUSSION

Interpreted through the three-dimensional engagement framework of Fredricks et al. (2004), the findings indicate that the Mathematics Camp fostered all three dimensions of engagement among the participating students. Behavioral engagement was evident in the students' consistent reports of participating in activities, answering on the board, and joining the games, supported by the high survey ratings for active involvement. Emotional engagement was the most prominent dimension: students repeatedly described enjoyment, interest, and a positive attitude toward mathematics, and several explicitly attributed their changed feelings to the warmth of their teacher and the fun of the activities. Cognitive engagement, though less directly probed, was reflected in students' accounts of studying in advance, doing homework, solving puzzles, and investing effort to understand topics they had previously found difficult. Examining these dimensions together, rather than in isolation, provides a richer characterization of how the camp shaped students' involvement, consistent with the multidimensional approach Fredricks et al. (2004) advocate.

These patterns align with prior research. The improvement in attitude and the strong role of peer cooperation echo Ling et al. (2009), who reported that mathematics-camp activities improved pupils' attitudes and promoted social skills, while the perceived enjoyment and benefit of the hands-on activities are consistent with Noorani et al. (2010). The prominence of teacher demeanor in the students' responses likewise resonates with Goossens' (2013) observation that classroom engagement is shaped by affective and relational conditions, not by task design alone.

The significant gain on the achievement test complements the qualitative findings and suggests that the engagement observed during the camp was accompanied by measurable learning gains of a large magnitude. The within-group variation in those gains, however, indicates that the intervention was not uniformly effective, and the design constraints discussed below caution against interpreting the gain as a pure causal effect of the camp.

## LIMITATIONS OF THE STUDY

Several limitations should be considered when interpreting these findings. First, the study employed a single-group, one-school design with a small, purposively selected sample ( $n = 16$ ), which limits the generalizability and transferability of the results to other learners, schools, and settings. Second, the absence of a control or comparison group means that the observed gains in engagement and achievement cannot be attributed to the camp alone; maturation, repeated testing, and instruction received outside the camp may also have contributed. Third, no follow-up data were collected, so it remains unknown whether the observed gains persisted or dissipated after the camp concluded.

Fourth, the very high and uniform survey responses raise the possibility of social-desirability or acquiescence bias and may also reflect the brevity of the six-item instrument; the instrument's reliability and validity were not formally established in this study. Finally, classroom observations were limited by time constraints and

were therefore not developed into a fully independent strand of evidence, which constrained the triangulation of data sources. These limitations are addressed in the recommendations below.

## CONCLUSION

The Mathematics Camp program was successfully conducted, and its outcomes were rewarding. The activities conducted during the camp achieved their objectives of promoting a positive attitude toward mathematics and motivating students to learn it. With the right attitude toward mathematics, students enjoy learning mathematics and mathematical problem solving, develop interpersonal and study skills, and consolidate their basic mathematical skills. The students' highly positive feedback provides a strong basis for conducting similar activities in the future.

Overall, the qualitative data revealed that students showed a positive attitude toward mathematics, as reflected in their responses and engagement in class. Participants perceived the Mathematics Camp activities as exciting and enjoyable and reported that the activities stimulated their interest in mathematics and motivated them to learn it. Participants agreed that they were actively involved in the activities and gave full cooperation to their team members in group activities. These findings were consistent with the results of the students' performance in the achievement test. Overall, the participants were satisfied with the Mathematics Camp.

Building on these limitations, several directions are recommended for future research. Subsequent studies could adopt a quasi-experimental design that compares a mathematics-camp group with a group receiving regular after-school tutoring or no intervention, enabling stronger causal inferences. The sample could be expanded to include multiple schools across urban and rural locations and additional grade levels, with a target of roughly 60–80 students, to improve generalizability.

Survey instruments should undergo pilot testing, item analysis, and reliability estimation (e.g., Cronbach's alpha), together with content-validity review by experts. Trustworthiness could be strengthened through multiple rounds of interviews (pre-camp, post-camp, and follow-up) and the use of member checking or peer debriefing. Finally, deliberately sampling students who showed little improvement or lower satisfaction would add nuance and credibility to the account of how and for whom such camps work.

Finally, the present investigation was constrained by time and by the limits of a qualitative, single-case design. Further study is therefore recommended to consolidate and refine the findings through a mixed-methods approach with a larger sample and, where feasible, a comparison group. Students' active involvement in the classroom, in particular, merits continued investigation as a condition for optimal learning.

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