Lived Experiences of Grade 7 Filipino Students Using Bar Models in Matatag Algebra Lesson Exemplars

Kathleen Erikah Dahe[1*], James L. Paglinawan, PhD[2]

[1]Master of Science in Mathematics Education, Central Mindanao University Musuan, Bukidnon, Philippines

[2]Associate Professor IV, Central Mindanao University Musuan, Bukidnon, Philippines

***Corresponding Author**

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ABSTRACT

The transition from arithmetic to algebra often triggers "symbol shock" among Filipino learners, where variables are perceived as abstract symbols disconnected from reality. This phenomenological study explored the lived experiences of 15 Grade 7 students at Sumilao National High School as they engaged with algebraic expressions and simple equations through MATATAG lesson exemplars implemented in the fourth quarter of school year 2025-2026. Data were collected via semi-structured interviews, "3-box" reflection activities involving relatable scenarios like cupcake sharing and budgeting, represented through bar models and colored strips, and researcher's notes. Thematic analysis revealed five emergent themes: (1) visual representations effectively bridged abstract algebraic concepts to concrete real-life scenarios ;(2) students initially encountered challenges in constructing bar models, specifically in labeling unknown quantities and representing operations like subtraction; (3) conceptual breakthroughs occurred through collaborative visualization, where variables were reconceptualized as "missing pieces" within equal-length bar configurations; (4) participants' perceptions shifted from viewing algebra as an abstract requirement to a practical tool for daily utility; and (5) exemplar strengths included the combination of group collaboration, concrete manipulatives, and guided teacher feedback. Findings revealed that visual scaffolding and social negotiation are essential for reducing cognitive load during algebraic transitions. These findings indicate that MATATAG-based visual and contextualized instruction effectively supports the transition from arithmetic to algebra by reducing abstraction, promoting collaboration, and grounding learning in meaningful experiences. However, the results also highlight the need for deliberate scaffolding to address initial difficulties in translating word problems into visual representations, ensuring smoother cognitive transitions for learners.

Keywords: MATATAG curriculum, bar model method, algebraic transition, phenomenological study, visual scaffolding.

INTRODUCTION

The transition from arithmetic to algebra represents a pivotal cognitive shift in mathematics learning, often marked by "symbol shock," where students initially view variables as confusing, meaningless letters rather than functional tools for generalization and problem-solving (García Fajardo et al., 2025; Küchemann, 1980). In the Philippine context, this anxiety is exacerbated by a tendency among students to treat mathematics as a set of procedural rules rather than a practical, real-world instrument, particularly when approaching word problems. Recognizing these challenges, the Department of Education (DepEd) introduced the MATATAG Curriculum (2023), emphasizing functional literacy and the use of lesson exemplars that situate abstract concepts within authentic, everyday contexts. Despite the MATATAG Curriculum's alignment of content with lived experiences to reduce cognitive and affective barriers to algebra learning, research shows Filipino students continue to experience initial confusion and nervousness when first encountering algebraic representations. (Caballero & Natividad, 2022; Guevarra et al., 2025; Trayco, n.d.).

Real-life contextualization in mathematics instruction enhances student engagement and conceptual understanding, while global studies confirm that peer group math anxiety levels independently predict achievement beyond individual anxiety effects (Lau et al., 2022). However, a gap remains in understanding how Filipino learners specifically experience these pedagogical innovations, particularly within the MATATAG framework. Data from 15 Grade 7 respondents revealed a common pattern of apprehension, which, when addressed through visual aids such as bar models and colored strips, transformed abstract symbols into manipulable, cognitively meaningful constructs. The bar model method provided a pictorial scaffold that improves students' problem-solving proficiency from "beginning" to "developing" levels, enabling learners to visualize relationships between known and unknown quantities and supporting both reasoning and problem-solving (Cancio, 2022).

This study gained significance by examining how authentic contexts, such as budgeting for school snacks, sharing food with relatives, or calculating discounts in a sari-sari store, reshaped students' perceptions of algebra as a relevant and functional tool. By investigating how lesson exemplars, complemented by interactive and collaborative strategies, fostered conceptual clarity, the research addressed a critical gap linking instructional design to student emotional readiness. Findings revealed that when learners perceived variables as "missing pieces" of real-world situations rather than abstract symbols, they experienced meaningful cognitive breakthroughs. Consequently, this study documented these qualitative shifts, providing insights that can inform the refinement of pedagogical strategies aimed at making algebra both comprehensible and applicable, reinforcing its role not merely as a curricular requirement but as an essential instrument for everyday life.

METHODOLOGY

Research Design

This study employed a qualitative phenomenological research design to explore the lived experiences of Grade 7 students at Sumilao National High School as they engaged with algebraic concepts through the DepEd MATATAG lesson exemplars. The phenomenological approach was selected to move beyond objective performance metrics, providing a deep, humanized understanding of how learners experienced the transition from arithmetic to algebra. The focus was on students' narratives of cognitive and emotional responses, capturing feelings of "confusion," "nervousness," and eventual "fulfillment" as they engaged with authentic, real-life contexts.

Participants and Setting

The study was conducted during the fourth quarter, during the implementation of MATATAG units on algebraic expressions and simple equations. The participants consisted of fifteen Grade 7 students at Sumilao National High School. This sample size allowed for rich, idiographic analysis of individual perspectives, representing a spectrum from students who initially felt "clueless" to those who found the visual modeling "like a game." The classroom environment facilitated collaborative group work and interactive problem-solving activities, supporting the phenomenological focus on lived experiences.

Research Instruments

Data collection utilized three qualitative instruments:

Semi-Structured Interviews: A 10-item interview guide explored five key areas: engagement with real-world contexts, encountered challenges, cognitive breakthroughs, perceptions of relevance, and the effectiveness of specific lesson elements.

1. 3-Box Reflection Activity: This visual and narrative exercise required students to (1) illustrate a relatable real-life scenario (e.g., sharing food or buying school snacks), (2) represent the corresponding algebraic solution, and (3) complete a reflective sentence regarding the usefulness of algebra in their lives.
2. Researcher's Field Notes: Notes were recorded after every session to document observations of student engagement and classroom interactions.

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Data Collection Procedures

Data collection followed the organizational flow of the MATATAG exemplars, progressing from physical and pictorial representations (e.g., colored strips and bar models) to abstract symbolic equations. During the instructional period, students actively participated in collaborative and interactive activities. Following the lessons, the semi-structured interviews and reflection exercises were administered to capture students' retrospective accounts of their learning processes and emotional experiences.

Data Analysis Procedure

The analysis of the collected narratives and visual reflections followed a systematic thematic analysis approach**,** supported by a bracketing (epoché) process to ensure that the findings were grounded in the participants' lived experiences rather than the researchers' prior assumptions.

Bracketing Process (Epoché)

To maintain the integrity of the phenomenological design, the researchers consciously identified and set aside their prior knowledge and biases related to the MATATAG curriculum and the use of bar models. As mathematics educators, the researchers acknowledged their existing belief in the effectiveness of visual strategies; however, these were deliberately bracketed throughout the study. This was done through reflective note-taking before and during data analysis to monitor possible influences on interpretation. During analysis, priority was given to the students' own words, such as describing algebra as a "puzzle," "game," or "missing piece," instead of applying formal mathematical terms. This process allowed themes to emerge directly from the participants' experiences.

Initial Coding and Familiarization

The researchers carefully read and reviewed the 15 transcripts and visual responses to become familiar with the data. Significant statements and meaning units were identified and coded using open coding. Codes such as "nervousness," "confusion at first," "seeing the answer without guessing," and "colored strips" were taken directly from the participants' responses. Consistent with the bracketing process, codes were based on actual student expressions rather than existing theories or expectations.

Theme Development

Initial codes were clustered into five broader themes capturing students' lived experiences with MATATAG algebra exemplars (see Table 1). For example, responses about "cupcake sharing making quantities visible through colored strips" formed "Visual Representation Bridging Abstract Algebra to Real-Life Contexts" (Theme 1, n=15/15), while codes like "confusing at first... no x we can use" and "nervousness labeling unknowns" clustered under "Challenges in Constructing Bar Models from Word Problems" (Theme 2, n=12/15). Descriptions of "it clicked when group leader showed equal-length bars" and "x as missing piece" emerged as "Breakthroughs through Collaborative Visualization" (Theme 3, n=15/15). Researchers conducted constant comparative analysis across all 15 responses, ensuring each theme achieved sufficient participant support, accurately reflected the data, and aligned with the study's phenomenological focus on authentic lived experiences.

Synthesis and Validation

In the final stage, the themes were reviewed and organized to answer the research questions. Data from the interviews and the 3-box reflection activities were compared to strengthen the findings. This process highlighted the "meaning-before-rules" understanding developed by the students. To ensure credibility, the researchers conducted peer debriefing to confirm that the themes, such as Collaborative Visualization, were based on the participants' actual experiences rather than the researchers' personal perspectives.

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Ethical Considerations

This study adhered to established ethical guidelines to ensure the protection, dignity, and rights of all participants. Prior to data collection, informed consent was obtained from both the students and their parents or guardians, clearly explaining the purpose of the study, the voluntary nature of participation, and their right to withdraw at any time without penalty. Confidentiality and anonymity were strictly maintained by assigning pseudonyms to participants and securely storing all data, including interview transcripts and reflection activities, to prevent unauthorized access. Additionally, the study minimized potential psychological discomfort by framing questions in a non-threatening and supportive manner, particularly when discussing feelings of confusion, nervousness, or anxiety related to algebraic learning. The research also received approval from the school administration of Sumilao National High School, ensuring alignment with institutional policies and safeguarding the well-being of the students during the research process. These measures collectively ensured that the study was conducted in an ethically responsible manner while preserving the integrity of the participants' lived experiences.

Inter-coder Reliability

To ensure the consistency and reliability of the thematic analysis, an inter-coder agreement process was utilized. Two analysts, the primary researcher and the co-author, independently coded a subset of the 15 interview transcripts. Following the initial coding phase, the researchers met to compare their findings and resolve any discrepancies in code definitions or thematic boundaries through a consensus method. This collaborative approach ensured that the final themes were not the result of a single subjective interpretation but were verified by multiple analysts, thereby increasing the rigor of the qualitative findings

Credibility and Trustworthiness

The study employed several strategies to ensure the validity and credibility of the data. While member checking was not conducted due to time constraints and the specific school-based schedule of the participants, the credibility of the findings was strengthened through triangulation and peer debriefing. Data triangulation was achieved by cross-referencing three distinct sources: the semi-structured interview transcripts, the "3-box" reflection activity outputs, and the researcher's classroom observation notes. Furthermore, peer debriefing sessions were held between the researchers during the theme development stage to challenge potential biases and ensure that the emergent categories accurately reflected the students lived experiences.

Limitations and Trustworthiness of the Study

This study acknowledges several limitations that may influence the interpretation and transferability of its findings. First, the data collection was conducted over a one-week observation period only; thus, the results reflect short-term learning experiences and may not capture long-term retention or sustained conceptual development in algebra. Second, while the participants were not part of the researchers' regular class, the presence of the researcher during data gathering may still have introduced a degree of social desirability bias, where students might have been inclined to provide favorable responses.

To address this, measures were implemented to strengthen trustworthiness. Prior to and during the data collection process, participants were explicitly oriented that there were no right or wrong answers and that they were free to express confusion, disagreement, or difficulty without consequence. This was emphasized to encourage honest and authentic responses. Additionally, data were gathered using multiple sources, including semi-structured interviews and 3-box reflection activities, allowing for triangulation of responses. The researchers also maintained a reflective stance throughout analysis to reduce interpretive bias and ensure that findings were grounded in participants' actual expressions rather than researcher expectations.

Despite these limitations, the study maintains credibility through systematic bracketing, data triangulation, and transparent engagement with participants, ensuring that the themes generated accurately reflect the students' lived experiences during the MATATAG-based instruction.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue IV April 2026

Scope and Delimitation

The scope of this study explored the lived experiences of 15 Grade 7 students from Sumilao National High School, a public school in the Philippines, specifically focusing on their engagement with authentic learning through DepEd MATATAG lesson exemplars on algebraic expressions and simple equations. The research examined students' engagement with real-world contexts (e.g., cupcake-sharing scenarios), challenges encountered (e.g., constructing bar models), insights and breakthroughs in understanding algebra (e.g., visualization "clicks"), perceptions of algebra's relevance (e.g., budgeting applications), and the effectiveness of exemplar elements such as group activities and teacher feedback. Data were gathered through semi-structured interviews, reflection outputs, researcher notes, and classroom observations, with a focus on qualitative thematic analysis of student experiences. Lessons emphasized visual representations, including colored strips and bar models, within the MATATAG curriculum's Number and Algebra domain, conducted during classroom sessions in the fourth quarter of school year 2025–2026.

This study is delimited to a single class of 15 purposively selected participants, excluding broader demographic variables such as gender differences, socioeconomic status, or prior mathematics proficiency. It does not extend to other grade levels, subjects, or non-MATATAG curricula, nor does it include quantitative measures of learning outcomes, long-term retention, or comparative analysis with traditional teaching methods. Teacher perspectives, parental influences, and follow-up observations beyond immediate post-lesson reflections were also excluded. The geographic scope is limited to one educational setting in Sumilao National High School, Bukidnon, thereby limiting generalizability to broader national or international contexts, as well as digital or hybrid learning environments.

RESULT AND DISCUSSION

The study explored the lived experiences of Grade 7 students at Sumilao National High School as they engaged with algebraic concepts through the DepEd MATATAG lesson exemplars. Analysis of student responses, coupled with teacher observations, revealed five key emerging themes: (1) visual representation bridging abstract algebra to real-life contexts, (2) challenges in constructing bar models from word problems, (3) breakthroughs through collaborative visualization, (4) perceptions of algebra as relevant and practical, and (5) effective exemplar elements including collaboration, manipulatives, and feedback.

Thematic Summary

Table 1: Emergent Themes, Representative Quotes, and Frequency of Responses

Generated Theme	Representative Quotes from Respondents	Frequency (*n*=15)	Discrepant / Negative Cases
1. Visual representation bridging abstract algebra to real-life contexts	"The cupcake problem involving Thea, Julia, and Alexa helped me the most because using the colored strips made it easy to see the relationship between the quantities" (P10).	15 / 15	Participant 2 noted that while visuals were used, the process of representing was "hard" and required significant "time to process".
2. Challenges in constructing bar models from word problems	"It was confusing for me to represent it using the colored strips at first... initially, there are no x we can use, no numbers to be used" (P3).	12 / 15	Participant 9 felt the visualization eventually "erased" the difficulty of rules, viewing the challenge as a temporary hurdle rather than a struggle.
3. Breakthroughs through collaborative visualization	"It clicked when our group leader showed how the top row and bottom row must be equal in	15 / 15	Participant 7 relied on mimicry, stating they "copied the solutions" and "look at my notes"

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue IV April 2026

	length. Then I realized x was just a missing piece of the bar" (P11).		rather than experiencing a spontaneous visual breakthrough.
4. Perceptions of algebra as relevant and practical	"I used to think algebra was only for scientists, but now I know I can use it to estimate my daily expenses" (P11).	14 / 15	Participant 6 expressed a neutral perception, stating the new approach felt "a little normal" and that algebra remained "difficult" despite the visuals.
5. Effective exemplar elements: Collaboration, manipulatives, and feedback	"The group activities are the best for me because it made us collaborate our ideas... it leaves a mark that its not easy to forget" (P3).	15 / 15	Participant 10 identified "practice problems" as the best part of the lesson, prioritizing individual repetition over social collaboration.

The analysis of the data generated five emerging themes that describe the lived experiences of Grade 7 students in learning algebraic expressions through MATATAG lesson exemplars. These themes are presented and discussed in relation to relevant learning theories to provide a systematic interpretation of the findings.

Individual Variations

Although most responses were positive, several discrepant cases were observed. Two participants reported that bar models initially increased cognitive load, describing feelings of being "nervous" and "clueless" during early tasks. One participant continued to rely on procedural mimicry by following notes rather than independently interpreting visual models. Another participant described the experience as "a little normal," indicating a neutral emotional response. Additionally, one student preferred individual practice over group collaboration. These variations suggest that while MATATAG-based visual instruction is generally effective, individual differences in cognitive readiness, learning preference, and emotional engagement influence how students experience algebra learning.

Visual Representation Bridging Abstract Algebra to Real-Life Contexts

Emergent Theme 1

The transition from arithmetic to algebra revealed a significant shift in how students interpreted mathematical concepts, particularly when visual representation was introduced. The transition from arithmetic to algebra represents a pivotal cognitive shift, often marked by "symbol shock," where students view variables as confusing, meaningless letters. Participants described that real-life contextualization, combined with visual aids such as bar models and colored strips, transformed abstract symbols into meaningful and manipulable constructs. Real-life contextualization in mathematics instruction enhances student engagement and conceptual understanding by providing situational reliability. Instead of perceiving variables as confusing or meaningless letters, students began to understand them as concrete "missing pieces" within a structured representation. This shift was consistently reflected in their narratives. As one participant shared,

Participant 10: "The cupcake problem involving Thea, Julia, and Alexa helped me the most because using the colored strips made it easy to see the relationship between the quantities. It made the 'unknown' feel like a real object I could move around."

Participant 11: "I remember using the colored strips to show the unknown numbers. It was like building something instead of just writing numbers."

Students further emphasized that visual aids provided a "clear and direct" arrangement of values, allowing them to grasp relationships before engaging in computation.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue IV April 2026

Sub-theme 1: Pictorial Scaffolding.

Students found that visual aids provided a "clear and direct" arrangement of values, allowing them to grasp relationships before engaging in computation. The verbatim responses highlight how learners relied on visual clarity to anchor their understanding. This is evidenced in the 3-box reflection artifacts, such as Participant 7,

Participant 7: *I went to the plaza to get some fresh air and hang out with my friends; there are 5 of them and we have 25 pesos to buy some food. Let x be the amount each person will contribute or spend. 5x=25, x=25÷5, x=5 Each person will spend 5 pesos. Now I understand algebra can help me divide money fairly among friends.*

Participant 7 Box 1 to illustrate a trip to the plaza with five friends, mapping this social scenario directly to the equation 5x=25 in Box 2. This suggests that visual representation supported students in transitioning from initial exposure to developing proficiency by providing a concrete representation of the variable.

Thus, this aligns with constructivism, where learners build understanding by manipulating concrete representations before abstract symbols.

Challenges in Constructing Bar Models from Word Problems

Emergent Theme 2

Despite the benefits of visual representation, participants experienced initial difficulty when required to translate word problems into bar models. The shift to representational thinking is often accompanied by initial confusion and nervousness, particularly when students are asked to "turn a story into a drawing" instead of solving directly. Students encountered a "translational resistance" where the absence of immediate numbers made the process feel like navigating into the unknown. This challenge reflects a gap between understanding the problem context and representing it visually. Participants expressed feelings of confusion, nervousness, and pressure, particularly when identifying unknown quantities and representing operations such as subtraction.

Sub-theme 1: Representational Struggle.

Students were tasked to represent the following word problem using uncut colored paper strips and decide how to cut (not solve it): "Alexa was taught by her father how to cook cupcakes. She shared her knowledge with her friends and helped them in making one. To help one of their friends fund her school project, they prepared cupcakes to be sold during the school fair. During the school fair, Julia sold twice as many cupcakes as her friend Thea. Alexa sold three times as many cupcakes as Thea. Alexa sold 78 cupcakes. How many cupcakes has Thea and Julia been able to sell?"

In groups of five students, many were caught unaware by the difficulty of representing logic visually, specifically in labeling unknown quantities and depicting operations. Researcher's Field Notes from Session 1 documented that of the five groups, four representations were correct but showed different ways of representing the problem, while one representation was incorrect. This confirms it takes time for students to master visual modeling. This difficulty is clearly captured in the response of one participant who stated, *Participant 3: "It was confusing for me to represent it using the colored strips at first... initially, there are no x we can use, no numbers to be used, we just need to represent it using strips at first."*

Participant 4: "The group activity, representation was honestly very confusing on my part, I was used to the abstract part of solving, and I struggled in representing it."

Such narratives indicate that the shift from procedural arithmetic to representational thinking introduced an additional cognitive demand, where the act of drawing was perceived as an "extra step." This difficulty is further supported by the Researcher's Field Notes from Session 1, which documented that "only half of the activities prepared were accomplished" because "it takes time for them to make the representations." These difficulties reflect the transition from procedural arithmetic to representational thinking. The findings suggest that while visual modeling is beneficial, it requires deliberate scaffolding and guided practice to support students in overcoming initial representational challenges.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue IV April 2026

Figure 1. Group 3 (Incorrect) and Group 5 (Correct) Representations of Cupcake Word Problem Using Student-Cut Colored Paper Strips

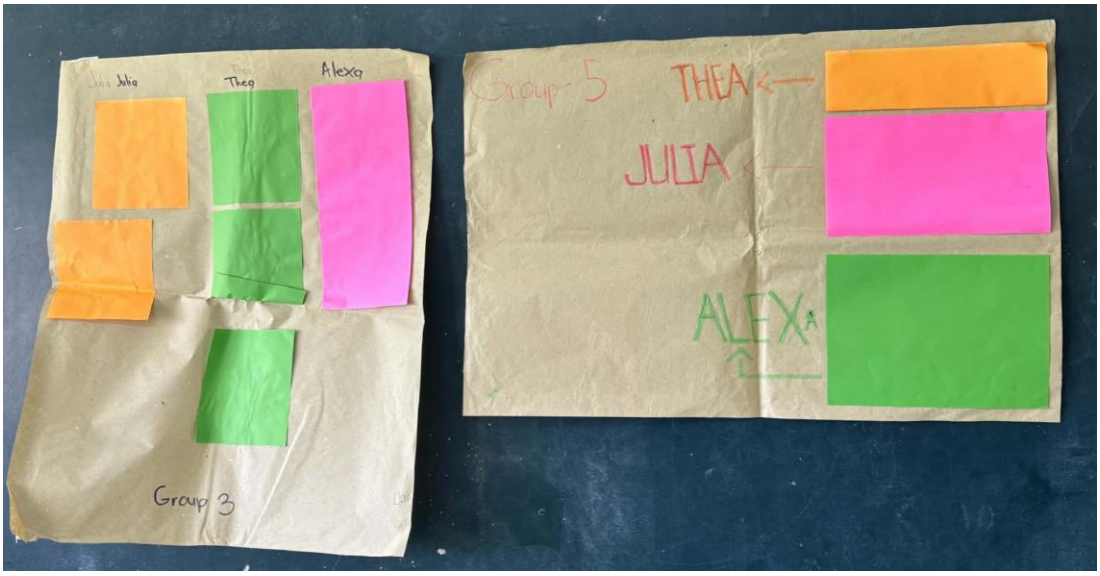


Figure 2. Group 2 (Correct) Representations of Cupcake Word Problem Using Student-Cut Colored Paper Strips

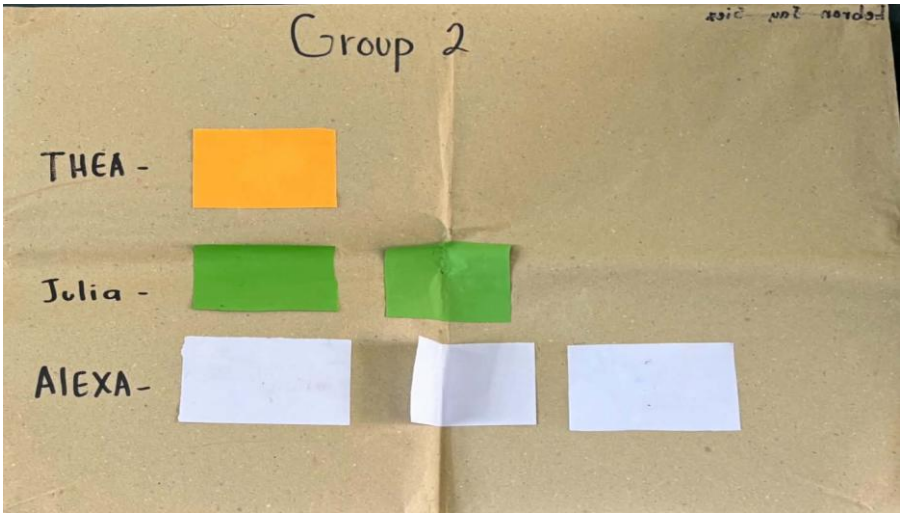
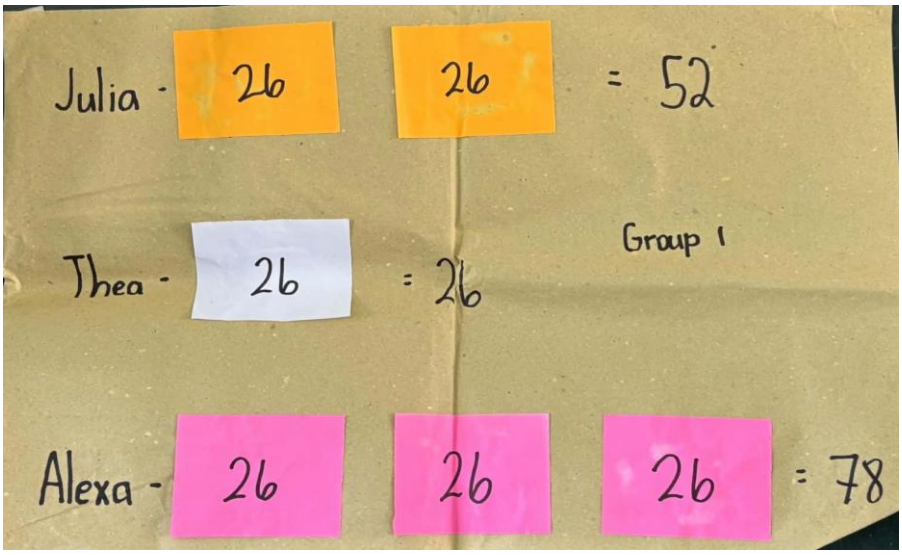


Figure 3. Group 2 (Partly correct since they have written numbers) Representations of Cupcake Word Problem Using Student-Cut Colored Paper Strips



ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue IV April 2026

Figure 4. Group 4 (Incorrect) Representations of Cupcake Word Problem Using Student-Cut Colored Paper Strips

Breakthroughs through Collaborative Visualization

Emergent Theme 3

A defining aspect of the participants' experiences was the occurrence of "click" moments, where understanding suddenly emerged after initial periods of confusion. Breakthroughs in understanding were documented as "click" moments where the logic of algebra suddenly became visible and stable. These insights typically emerged when students achieved a "meaning-before-rules" understanding through social interaction and visual comparison. Students described these breakthroughs as realizations where the variable x ceased to be a confusing letter and became a "missing piece" in a balanced structure. This was clearly expressed by one participant who stated,

Participant 11: "It clicked when our group leader showed how the top row and bottom row must be equal in length. Then I realized x was just a missing piece of the bar."

Participant 14: "When I realized the '=' sign is just like the middle of the bar model. Everything on top must match the bottom."

These responses show that conceptual understanding emerged as students began to interpret algebraic expressions through structural balance rather than symbolic manipulation.

Sub-theme 1: Structural Realization.

Students described a moment of clarity where the variable x became a "missing piece" in a balanced structure. These breakthroughs were rarely isolated events; instead, they were shaped through social interaction, peer discussion, and shared reasoning within group work. This breakthrough is physically represented in Participant 4's Box 2 artifact, which illustrated a two-row bar model for $2x + 3 = 11$, showing the rows as equal entities.

Perceptions of Algebra as Relevant and Practical

Emergent Theme 4

Participants demonstrated a clear shift in their perception of algebra, moving from viewing it as an abstract and difficult subject to recognizing it as a practical tool for everyday use. The study documented a qualitative shift in how students perceived the utility of algebra. Previously viewed as a subject "only for scientists," algebra was redefined as an essential instrument for daily tasks like budgeting and fair sharing. Engagement with real-

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue IV April 2026

life scenarios allowed students to connect algebraic thinking to familiar contexts, thereby enhancing both understanding and relevance. This change in perception is reflected in the statement:

Participant 11: "I used to think algebra was only for scientists, but now I know I can use it to estimate my daily expenses."

Sub-theme 1: Functional Utility. Students began to reconstruct their understanding of algebra as a practical life skill applicable in shopping, sports, or managing expenses.

Participant 14: "My thinking changed because I realized algebra is everywhere, even in sports or shopping."

This indicates that contextualized learning enabled students to reconstruct their understanding of algebra as a functional life skill. These written reflections in Box 3 such as Participant 7's realization that algebra helps "divide money fairly among friends" provide evidence of sustained perceptual change. The findings suggest that when algebra is grounded in authentic experiences, students are more likely to perceive its value beyond the classroom.

Effective Exemplar Elements: Collaboration, Manipulatives, and Feedback

Emergent Theme 5

Participants identified key elements of the MATATAG lesson exemplars that contributed to their learning, particularly collaboration, the use of manipulatives, and teacher feedback. The synergy of support systems was cited as the primary reason for conceptual clarity. Students identified the combination of physical manipulatives, peer brainstorming, and iterative teacher feedback as the most effective facilitators. Group activities allowed students to exchange ideas and support one another, while colored strips made abstract concepts visible. Immediate feedback from the teacher helped clarify misunderstandings and guided students toward correct interpretations. This is illustrated in the response:

Participant 3: "The group activities are the best for me because it made us collaborate our ideas... it leaves a mark that its not easy to forget."

Participant 14: "Teacher feedback. When the teacher corrected our representation, it helped the concept to become clear."

Sub-theme 1: Collaborative Scaffolding.

Group work provided a space for social negotiation where students could clarify ideas and correct misunderstandings in real time. Such findings suggest that the integration of collaborative learning, visual tools, and responsive instruction created a supportive learning environment that facilitated understanding and reduced the anxiety associated with solving algebraic problems. The Teacher's Notes from Session 2 reinforce this, noting that while some groups initially made mistakes, they eventually represented concepts correctly through "feedback and guidance... prompting the learners and letting them analyze the problem."

The five emergent themes systematically correspond to complementary theoretical frameworks that validate the MATATAG exemplars' pedagogical effectiveness. Visual representations (Theme 1) reflect constructivist principles where students progress from concrete manipulatives to abstract algebraic understanding through colored strips and bar models. Representational struggles (Theme 2) illustrate Vygotsky's Zone of Proximal Development, revealing the scaffolded transition required from procedural arithmetic to visual modeling competence. Collaborative breakthroughs (Theme 3) demonstrate Cognitive Load Theory's benefits, as visual externalization reduced working memory demands and enabled sudden conceptual clarity. Perceptual shifts (Theme 4) align with Situated Cognition Theory through authentic contextualization that transformed algebra from abstract subject to practical life skill. Finally, effective exemplar elements (Theme 5) embody Social Constructivism, where peer negotiation and guided feedback facilitated co-constructed mathematical understanding.

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Overall, the findings indicate that MATATAG-based visual and contextualized instruction effectively supports the transition from arithmetic to algebra by reducing abstraction, promoting collaboration, and grounding learning in meaningful experiences. However, the results also highlight the need for deliberate scaffolding to address initial difficulties in translating word problems into visual representations, ensuring smoother cognitive transitions for learners.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed to enhance the teaching and learning of algebra through MATATAG lesson exemplars, particularly in addressing students' difficulties in transitioning from arithmetic to algebraic thinking.

1. Instructional Scaffolding for Visual Representation

It is recommended that teachers implement structured and consistent scaffolding activities to support students' development of visual representation skills. Short daily exercises (approximately 10 minutes) using manipulatives such as colored strips or bar models may be integrated prior to formal algebra lessons. This gradual exposure is intended to reduce initial confusion and ease students into representational thinking, particularly during the translation of word problems into visual models.

2. Strengthening Collaborative Learning Strategies

Given the positive role of peer interaction in facilitating understanding, teachers are encouraged to adopt structured collaborative learning approaches. Peer teaching rotations and clearly assigned group roles (e.g., facilitator, recorder, checker) may be utilized to maximize student engagement and shared problem-solving. Such strategies promote collaborative visualization and help reduce individual cognitive burden during complex tasks.

3. Development of Representation-First Learning Modules

Curriculum developers are encouraged to design a dedicated "representation-first" module focused on strengthening students' understanding of visual modeling before introducing formal symbolic equations. This module should include carefully sequenced real-life scenarios that progressively build students' capacity to interpret, construct, and analyze bar models, thereby addressing observed gaps in representational skills.

4. Integration of Contextualized and Real-Life Scenarios

To strengthen the functional relevance of algebra, it is recommended that learning materials incorporate a wider range of authentic, context-based scenarios such as budgeting, sharing resources, and managing everyday transactions. These relatable contexts should be systematically embedded in lessons to reinforce the practical application of algebra and enhance student motivation and engagement.

5. Enhancement of Teacher Feedback Practices

Teachers should be provided with targeted professional development focusing on effective questioning techniques and real-time feedback strategies during visual modeling activities. Immediate and guided feedback is essential in correcting misconceptions, refining student understanding, and supporting the gradual construction of accurate mathematical representations.

6. Directions for Future Research

Future studies may consider expanding the scope of participants to include larger and more diverse samples to improve generalizability. Longitudinal research is also recommended to examine the retention of conceptual understanding over time. Additionally, comparative studies between MATATAG-based instruction and other visual modeling approaches, such as the Singapore bar model method, may provide further insights into the effectiveness of different instructional frameworks.

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