



## The Effects of Activities Management According to The GPAS 5 Steps Process on Mathematics Learning Achievement of Grade 3 Students

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### Abstract

**Background and Aim:** Mathematics learning progresses systematically, starting from fundamental knowledge to analytical thinking and complex problem-solving. Given the significant role of mathematics in 21st-century education, it enhances creativity, logical reasoning, and decision-making skills necessary for solving problems effectively and appropriately. This research aims to: 1) Compare the mathematics learning achievement of third-grade students before and after learning through the GPAS 5 Steps Process. and 2) Compare the post-learning mathematics achievement of third-grade students who have undergone the GPAS 5 Steps Process instructional process with the 70% criterion.

**Materials and Methods:** This study employs a quantitative research design with a quasi-experimental approach. The sample group consisted of 27 third-grade students from a single classroom at the Demonstration School of Valaya Alongkorn Rajabhat University, under the Royal Patronage, in Pathum Thani Province, during the 2023 academic year. The sample was selected using a cluster sampling method. The research instruments included: 1) Six lesson plans for teaching multiplication in mathematics using the GPAS 5 Steps Process, with each lesson lasting 2 hours, totaling 12 hours. and 2) A mathematics achievement test on multiplication, consisting of 30 items. The statistical methods used for data analysis included percentages, means, standard deviations, and hypothesis testing using a t-test.

**Results:** 1) After activities management according to the GPAS 5 Steps Process, the students mathematics learning achievement of grade 3 students was higher than before at a significance level of .05 ( $M = 24.37$ ,  $SD = 2.79$ ,  $t = 25.671$ ,  $p = 0.000$ ) and 2) after activities management according to the GPAS 5 Steps Process, the students mathematics learning achievement of grade 3 students was higher the determined criterion set at 70% at a significance level of .05 ( $M = 24.37$ ,  $SD = 2.79$ ,  $t = 6.278$ ,  $p = 0.000$ )

**Conclusion:** The GPAS 5-Step Process is an effective method for enhancing students' mathematics achievement. It provides a structured and sequential learning approach, ensuring that students who participate in this learning process achieve post-learning mathematics scores that surpass the predetermined criterion.

**Keywords:** GPAS 5 Steps Process; Mathematics Achievement

### Introduction

The National Education Act of B.E. 2542 (1999), Section 22, states that education must be based on the principle that every learner can learn and develop themselves. Learners are considered the most important factor in education, and the learning process must promote their natural development to their fullest potential (Ministry of Education, 2003). Therefore, education serves as a crucial tool in enhancing and developing individuals to achieve quality standards. Mathematics, in particular, plays a fundamental role in the study of science, technology, and other disciplines, forming the foundation for the development of human resources and the national economy, enabling competitiveness on the global stage. Consequently, mathematics education must undergo continuous development to remain modern and aligned with the rapidly advancing economic, social, and scientific and technological knowledge in the era of globalization. Education plays an increasingly significant role in contemporary and future societies, impacting daily life and various professional fields. Everyone must acquire knowledge and understanding of the natural world and human-created technologies. They should be able to apply their knowledge rationally, creatively, and ethically. Mathematics is essential to success in 21st-century learning, as it fosters creativity, logical reasoning, systematic thinking, and structured problem-solving. It enables individuals to analyze problems or situations comprehensively, make informed predictions, plan strategically, and make sound decisions to solve problems effectively. Furthermore, mathematics skills apply to real-life situations, enhancing efficiency in decision-making. Mathematics education is structured around core indicators and learning





standards outlined in the Basic Education Core Curriculum B.E. 2008 and its 2017 revised edition. This curriculum prioritizes the development of essential 21st-century skills, including analytical thinking, critical thinking, problem-solving, creative thinking, technological proficiency, communication, and collaboration. These skills enable learners to stay informed about changes in the economy, society, culture, and the environment, preparing them to compete and coexist in the global community. Successful mathematics education must equip learners with the readiness and ability to continuously acquire new knowledge (Ministry of Education, 2017).

According to the National Test (NT) Student Quality Assessment Report for third-grade students in the academic year 2022, which includes a three-year retrospective report from academic years 2020 to 2022, the third-grade students at the Demonstration School of Valaya Alongkorn Rajabhat University under the Royal Patronage had an average mathematics score of 42.90, 41.85, and 41.41, respectively. These scores were below 50%, placing them at a lower level compared to the national average, as reported by the Office of the Basic Education Commission (2023). As an instructor, the researcher reviewed the mathematics achievement scores in multiplication from learning activities during the academic years 2020–2022. The findings indicated that only a small proportion of students achieved at least 70% correctness in multiplication (Valaya Alongkorn Rajabhat University under the Royal Patronage Demonstration School, 2018). An analysis of the factors contributing to students' low mathematics achievement, which fell below the 70% benchmark, revealed that the primary cause was the impact of the COVID-19 pandemic. Educational institutions had to adjust their plans and learning objectives, modify their learning management systems, and cope with challenges in remote learning. Teachers, parents, and students faced difficulties, including students' lack of concentration, limited access to electronic devices, and challenges in accessing the internet (National Economic and Social Development Council [NESDC], 2020). Additionally, unstable online communication affected the quality of teaching, resulting in reduced instructional time. Teachers expressed concerns about adapting to new learning models while ensuring that students met the standards and indicators outlined in the Basic Education Core Curriculum (Ministry of Education, 2017). Consequently, teachers often rushed through lessons, leaving students unable to keep up. The predominant use of lecture-based teaching in online classes further hinders students' comprehension. Some instructional media used in online learning were not effective enough to enhance students' understanding. As a result, students struggled with the lessons, lost interest in studying, failed to complete their assignments, and displayed a lack of responsibility. These issues highlight the necessity for improvements and further development in teaching methods. This aligns with the study by Sattrarat & Nattanun (2022), which found that students often struggle to connect prior knowledge with new concepts on their own, leading to ineffective knowledge construction and unsuccessful learning outcomes, particularly in mathematical thinking skills. This may be due to insufficient promotion of students' self-discovery in learning. Furthermore, interviews with teachers indicated that more instructional time is required for teaching or reviewing students' prior knowledge.

As an instructor, the researcher has reviewed relevant studies and academic works from various scholars and educators, such as Office of Innovation for Educational Management, 2008; Jankra et al (2018; Institute of Academic Development, 2021; Po Ngern et al (2021; Tanyarattanasrisakul, M. (2023; and Sattrarat & Nattanun, 2022. The findings indicate that the GPAS 5 Steps learning process is a widely accepted approach that has been implemented in curriculum development and mathematics instruction. This method fosters non-accelerated learning and creates a learning environment that encourages students to think independently and apply knowledge effectively.

The GPA5 5-Step learning process enables students to learn systematically:

STEP 1: Gathering – Students develop skills in collecting and selecting relevant information, which serves as a foundation for the next step.

STEP 2: Processing – Students enhance their skills in organizing and analyzing the information collected in STEP 1, establishing connections that facilitate deeper learning and understanding.





STEP 3: Applying and Constructing Knowledge – Students are trained in decision-making, problem-solving, and utilizing acquired knowledge to construct new concepts.

STEP 4: Applying and Communication Skills – Students apply their knowledge to solve given problems or situations, developing effective communication skills in the process.

STEP 5: Self-Regulating – Students assess and reflect on their cognitive processes to ensure a deeper understanding and continuous improvement.

Based on this finding or concept, the researcher is interested in experimenting with Activity Management according to the GPAS 5-Step Process on Mathematics Learning Achievement of Grade 3 Students at The Demonstration School of Valaya Alongkorn Rajabhat University, under the Royal Patronage, in Pathum Thani Province.

## Objectives

1. Compare the mathematics learning achievement of third-grade students before and after learning through the GPAS 5 Steps Process. and

2. Compare the post-learning mathematics achievement of third-grade students who have undergone the GPAS 5 Steps Process with the 70% criterion.

## Literature review

Learning Management through the GPAS 5 Steps Process refers to a learning management approach that promotes critical thinking, creativity, problem-solving, and self-regulation by integrating these steps into classroom instruction. Through this process, teachers can design learning activities and create a classroom environment that encourages students to think independently, apply their knowledge effectively, and communicate their ideas confidently. The Office of Innovation for Educational Management, under the Office of the Basic Education Commission, Ministry of Education, synthesized various concepts and theories to develop a framework for thinking skills. This framework consists of four main components: Gathering, Processing, Applying, and Self-Regulating (GPAS). These cognitive processes have been integrated into an educational approach that fosters analytical thinking and problem-solving skills in students (Office of Innovation for Educational Management, 2008). The GPAS 5 Steps Process, as outlined by the Institute of Academic Development (2021), consists of the following steps:

STEP 1: Gathering by students develops skills in collecting and selecting relevant information. This includes 1) Identifying key issues for data collection; 2) Setting learning objectives; 3) Observing using sensory perception; 4) Gathering information through observation, and 5) Synthesizing prior knowledge and summarizing key points.

STEP 2: Processing by students enhances their ability to organize and analyze the data collected in STEP 1, establishing meaningful connections for learning. This includes 1) Distinguishing and categorizing information; 2) Comparing similarities and differences; 3) Grouping data into categories; 4) Establishing connections and visualizing relationships; and 5) Verifying the accuracy of information and sources.

STEP 3: Applying and Constructing Knowledge. Students develop decision-making and problem-solving skills by applying their acquired knowledge to construct new concepts and ideas. This includes selecting the most appropriate problem-solving approach for a given problem or situation.

STEP 4: Applying and Communication Skill by students enhances their ability to apply knowledge to real-world problems while developing effective communication skills. This includes 1) Presenting ideas accurately and clearly; 2) Collaborating and participating in group work; 3) Public speaking and classroom presentations, and 4) Conveying ideas through written reports.

STEP 5: Self-Regulating. Students develop self-monitoring and evaluation skills to assess their cognitive processes. This includes 1) Self-assessment and peer evaluation, and 2) Reflecting on their learning progress. By implementing the GPAS 5 Steps learning process, students are guided through a

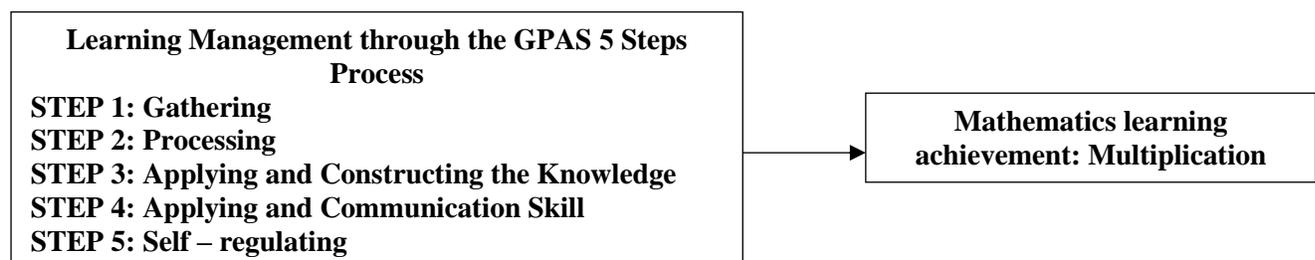


structured and systematic approach that enhances their ability to think critically, solve problems effectively, and regulate their own learning, thereby fostering academic success and developing lifelong learning skills.

**Mathematics learning achievement** refers to the cognitive abilities acquired through learning experiences and practice, leading to proficiency in mathematical concepts. It can be assessed using exercises or tests that align with the desired cognitive learning behaviors. Mathematics learning achievement serves as a reflection of students' understanding and problem-solving skills, which develop progressively over time (Wilson, 1971; Good, 1973). Mathematics learning achievement can be categorized into different levels of cognitive learning, as follows:

1. Knowledge and Recall – This level represents the basic cognitive skills in mathematical computation, demonstrating the lowest level of mental behavior.
2. Understanding – At this level, students' cognitive behavior is closely related to the knowledge and recall level but involves a greater degree of complexity.
3. Application – This level represents students' skills and abilities in decision-making and problem-solving in familiar situations. Students apply their prior experiences and practice gained through learning activities, selecting and implementing problem-solving processes with relative ease.
4. Analysis – At this level, students develop the skills and ability to solve unfamiliar problems that they have never encountered or practiced before. These problems are usually applied problems or situational challenges that remain within the scope of the subject matter but require students to apply their acquired knowledge and learning experiences to find solutions.

### Conceptual Framework



**Figure 1** Conceptual framework of the research

### Methodology

This study employs a quasi-experimental research design, using a one-group pretest-posttest approach. The experiment was conducted with a single group of students who were taught mathematics on the topic of multiplication using the GPAS 5 Steps Process. A pretest and a posttest were administered to assess their learning outcomes.

#### Sample Group

The sample group for this study consisted of 27 Grade 3 Students at The Demonstration School of Valaya, along with the Royal Patronage of King Rama X, in Pathum Thani Province during the academic year 2023. The sample was selected using a cluster random sampling method.

#### Research Instruments

Mathematics Lesson Plans on Multiplication Using the GPAS 5-Step Process.

1. A total of six lesson plans were developed, each lasting two hours, amounting to twelve hours of instruction. The lesson plans were designed based on the Basic Education Core Curriculum B.E. 2008 and its 2017 revised edition, following the learning standards and indicators for the mathematics subject. The lesson plans included learning objectives, course descriptions, instructional methods, activities, and assessment criteria. The plans were reviewed by experts using a rating scale evaluation method, yielding an average score ranging from 4.83 to 4.94, indicating a high level of appropriateness.



2. Mathematics Achievement Test on Multiplication A 30-item multiple-choice test with four answer choices was developed as a parallel pretest and posttest. The test construction was based on test development guidelines and techniques (Phatthiyathanee, 2015). and criterion-referenced achievement test construction principles (Srisaard, 2015). Experts reviewed the test to ensure content validity, yielding an Index of Item-Objective Congruence (IOC) between 0.67 and 1.00. A pilot study was conducted with 30 fourth-grade students who had previously studied multiplication to determine the difficulty index, discrimination index, and reliability. The results indicated (Difficulty index: 0.20 – 0.77, Discrimination index: 0.20 – 0.80, Reliability coefficient: 0.86)

**Data Collection**

The study was conducted during the 2023 academic year. The researcher implemented the six lesson plans on multiplication using Gpas' 5 Steps, totaling twelve hours of instruction. After completing the lessons, students were administered the mathematics achievement test, and the test scores were analyzed.

**Data Analysis**

1. Descriptive statistics were used to analyze the data, including percentage, mean, and standard deviation.
2. A dependent t-test was used to compare students' mathematics achievement before and after the intervention.
3. A one-sample t-test was used to compare students' posttest mathematics achievement scores against the 70% proficiency criterion.

**Results**

Results of the research on The Effects of Activities Management According to The GPAS 5 Steps Process on Mathematics Learning Achievement of Grade 3 Students. Show in Tables 1 and 2 as:

**Table 1** The findings of comparing the different mean scores on mathematics learning achievement of grade 3 students before and after activities management according to the GPAS 5 Steps Process.

Group	n	Pretest scores		Post-test scores		t	p
		M	SD	M	SD		
Experimental group	27	6.56	1.99	24.37	2.79	25.671**	0.000

\*\* p<.05

As presented in Table 1, after activities management according to the GPAS 5 Steps Process, the student's mathematics learning achievement of grade 3 students was higher than before at a significance level of .05 (M = 24.37, SD = 2.79, t = 25.671, p = 0.000)

**Table 2** The findings of comparing the mathematics learning achievement of grade 3 students after activities management according to the GPAS 5 Steps Process, with the criterion set at 70%.

Group	n	Full score	Criteria score	M	SD	t	p
Experimental group	27	30	21	24.37	2.79	6.278**	0.000

\*\* p<.05

As presented in Table 2, after activities management according to the GPAS 5 Steps Process, the student's mathematics learning achievement of grade 3 students was higher than the determined criterion set at 70% at a significance level of .05 (M = 24.37, SD = 2.79, t = 6.278, p = 0.000)





## Discussion

Research on the results of The Effects of Activities Management According to the GPAS 5 Steps Process on Mathematics Learning Achievement of Grade 3 Students at The Demonstration School of Valaya Alongkorn Rajabhat University under the Royal Patronage in Pathum Thani Province.

1. The comparison of mathematics learning achievement of Grade 3 students after receiving instruction through the GPAS 5 Steps process shows that their post-learning achievement was significantly higher than their pre-learning achievement at the .05 level. This indicates that the GPAS 5 Steps Process enhances the mathematics learning achievement of Grade 3 students. Additionally, this instructional approach focuses on developing higher-order thinking skills and problem-solving abilities, which are effective in improving students' academic performance in mathematics. This finding aligns with the research of Po Ngern et al (2021), which found that elementary school students exhibited a high level of higher-order thinking. This was due to teachers implementing the GPAS 5 Steps systematically and step by step, ensuring that every stage of the learning process incorporated problem-solving and creative thinking exercises. Students engaged in hands-on activities, making the learning process clear and structured, characterized by active learning combined with a backward design approach to align learning objectives. This approach fosters students' ability to think critically, act independently, solve problems effectively, and develop essential 21st-century learning and innovation skills, which are highly beneficial for teachers in guiding education toward Thailand 4.0. Similarly, the study by Tanyarattanasrisakul (2023) examined the implementation of the GPAS 5 Steps process in basic education, utilizing a standards-based curriculum. The study found that this process emphasizes innovation development while integrating relevant knowledge to ensure the success of learning activities. The approach relies on skills and processes as its core components, aligning with the required learning standards and indicators. Teachers are expected to structure lessons based on subject content while ensuring that students meet learning standards and understand how to apply this knowledge in innovation development. In later stages of the learning process, the focus shifts to the application of skills, desirable characteristics, and other competencies necessary for effective learning activities. Furthermore, research highlights the importance of mathematical connections and the desirable characteristics of mathematical literacy, including an appreciation of mathematics. Implementing the GPAS 5 Steps process effectively requires teachers to understand how learning content fits into different stages of the innovation development process. However, teachers may also integrate this instructional model into classroom action research. Through this approach, students not only develop innovative thinking within mathematical concepts but also experience meaningful learning in mathematics. This aligns with the findings of Jankra et al (2018), which emphasize the importance of formative assessment tools in providing students with informative feedback, leading to higher analytical thinking skills. Writing learning reflections allows students to express their thoughts and enhances their critical thinking. This self-assessment process enables students to review their understanding, helping teachers quickly assess their learning progress. Moreover, it fosters connections between classroom learning and real-life applications while encouraging student-teacher interactions. Additionally, the research of Sattrarat & Nattanun (2022) examined students' achievement in understanding quadrilaterals through the GPAS 5 Steps approach combined with multimedia materials. The study found that students' performance exceeded the 70% threshold, demonstrating the effectiveness of lesson plans that integrate GPAS 5 Steps with multimedia. This instructional approach emphasizes hands-on activities, allowing students to construct their knowledge through experiential learning, ultimately leading to improved academic performance.

2. The comparison of post-learning mathematics achievement of Grade 3 students after receiving instruction through the GPAS 5 Steps Process shows that their achievement exceeded the 70% threshold. This is because students actively engaged in learning activities following the GPAS 5 Steps process, Such as:

STEP 1: Gathering – Students reviewed and reinforced their knowledge by practicing data collection from mathematical situations or problems.





STEP 2: Processing – Students regularly summarized key mathematical concepts and symbols, allowing them to initiate learning, develop understanding, and grasp mathematical concepts independently.

STEP 3: Applying and Constructing the Knowledge – Students engaged in self-directed learning through activity worksheets, participated in class discussions, and later collectively summarized their learning experiences in class.

STEP 4: Applying and Communication Skills – Students presented their ideas in front of the class, while their peers and the teacher reviewed and verified the accuracy of their answers and reasoning.

STEP 5: Self-Regulating – Students took responsibility for their learning by reflecting on mathematical concepts throughout each step of the process, which enhanced their understanding and fostered independent learning, ultimately improving their academic achievement.

This aligns with the research of Po Ngern et al (2021), which found that elementary school teachers demonstrated a good understanding of the GPAS 5 Steps instructional approach, as evidenced by their test results. This is attributed to the implementation of a quality improvement model for teaching and learning under the GPAS 5 Steps framework, designed to enhance students' learning skills in the era of Thailand 4.0. The process emphasized Knowledge Sharing, Coaching from experts, and Professional Learning Communities (PLC) among teachers, school administrators, and peers to implement the GPAS 5 Steps teaching approach effectively.

## Conclusion

The GPAS 5 Steps learning process is an effective method for enhancing students' mathematics achievement. It is a structured, step-by-step learning approach that ensures students who participate in this process achieve improved mathematics learning outcomes. Post-learning mathematics achievement following the GPAS 5 Steps process was significantly higher than pre-learning achievement at the .05 significance level. Additionally, students' post-learning mathematics achievement exceeded the 70% threshold with statistical significance at the .05 level.

## Recommendation

### Recommendations for Applying the Research Findings

1. Teachers should thoroughly study the steps of the GPAS 5 Steps learning process, carefully design lesson plans, and allocate time appropriately, as the activities may require more time compared to traditional teaching methods.

2. Teachers should organize student groups with mixed abilities for activities and encourage collaboration within the group. All students should be given opportunities to express their ideas and engage in discussions following the GPAS 5 Steps process.

### Recommendations for Future Research

1. Future studies should explore the application of the GPAS 5 Steps learning process in other learning units within the mathematics curriculum.

2. Further research should investigate additional variables related to the GPAS 5 Steps learning process, such as students' attitudes toward mathematics learning and their ability to present mathematical concepts.

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