



2024

Catch-Up Material in Operations on Integers Using Flipbook Through Agile Model

Rochelle Kaye I. Villena

Philippine Normal University-North Luzon

Follow this and additional works at
pnu-onlinecommons.org/omp/index.php



Online Commons Citation

Villena, R.K.I., & Cardona, R.S. (2024)
Catch-Up Material in Operations on Integers Using Flipbook Through Agile Model
(Master's Thesis, Philippine Normal University-North Luzon)
Retrieved from pnu-onlinecommons.org/omp/index.php/pnu-oc/catalog/book/1538



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

CATCH-UP MATERIAL IN OPERATIONS ON INTEGERS
USING FLIPBOOK THROUGH AGILE MODEL

THESIS
Presented to
The Graduate Studies and Teacher
Educational Research in Indigenous Peoples Education
Philippine Normal University
North Luzon
Aurora, Alicia, Isabela

In Partial Fulfillment
of the Requirements for the Degree
MASTER OF ARTS IN EDUCATION
With Specialization in Mathematics

ROCHELLE KAYE I. VILLENA

_____ 2024



DEDICATION

This thesis is dedicated to learners, and educators alike, who strive for knowledge and contribute to the pursuit of better education, to all those whose unwavering support, guidance, and encouragement have been instrumental in its completion. Their contributions, both seen and unseen, have been deeply valued and appreciated.

Researcher



ACKNOWLEDGEMENT

The completion of this thesis would not have been possible without the generous guidance and assistance of several individuals and institutions to whom the researcher extends sincere gratitude.

Dr. Roldan S. Cardona, her research adviser for his assistance and generously giving his time and effort, for constructive criticisms and for patiently and diligently correcting the manuscript, for encouragement, challenges, and knowledge he imparted for further development of this study.

Panel members, for their time, expertise, and constructive feedback during the defense of this work. Their valuable insights have contributed significantly to its improvement.

Schools Division of Isabela, under the leadership of Dr. Rachel R. Llana, and to the dedicated school heads of the various high schools involved in this study. Their gracious permission and unwavering support made this study possible.

To her parents, Mr. and Mrs. Mario S. Villena, her siblings, Romar and Rose Ann, and her boyfriend, Mike, whose encouragement, guidance and prayer has been a constant source of strength and motivation.

To all whose names may not appear here but whose encouragement, advice, and belief in the researcher have been integral to the completion of this thesis. Supports given has been a constant source of inspiration.



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

Above all, to the Almighty God for the guidance, strength, and blessings. In moments of uncertainty and challenge, faith has been the researcher's anchor, providing solace, clarity, and resilience.

To all of them, Maraming Salamat Po!

Researcher



ABSTRACT

Name : ROCHELLE KAYE I. VILLENA

Title of Study : CATCH-UP MATERIAL IN OPERATIONS ON
INTEGERS USING FLIPBOOK THROUGH AGILE
MODEL

Key Concepts : FLIPBOOK, LEARNING MODULE, INTERACTIVE
SELF-LEARNING MODULE

Degree : MASTER OF ARTS IN EDUCATION

Specialization : MATHEMATICS

Before the pandemic, Philippine education struggled with persistent underachievement, particularly in mathematics, notably in operations on integers. This issue gained attention due to consistently poor performance in standardized assessments such as the NAT, PISA, and TIMSS. Presently, low mastery of integer operations in classrooms poses a concern, impeding progress in advanced mathematical topics. This study addresses this challenge by presenting the development, testing, and deployment of Math flipbook—a catch-up material designed to enhance Grade 7 students' performance in operations on integers. This initiative aligns with the Rapid Assessment of Pandemic Impact on Development (RAPID) Framework and the Basic Education Development Program (BEDP) 2030. Employing the Agile Model, the study progressed through Requirement Analysis, Design, Development, Testing, and Deployment phases. The flipbook integrates engaging themes based on student preferences while adhering to Grade 7 learning objectives.



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

Thorough testing by experts confirmed the flipbook's effectiveness in delivering educational content and fostering meaningful learning experiences. Evaluation criteria encompassed content, instructional, technical, and usability aspects, including Multimedia Design, Overall Interface, Controls & System Information, Customizability, and Hyperlinks. High ratings across these dimensions attest to the flipbook's efficacy as a learning resource. Deployment of the flipbook led to significant improvements in student test scores, underscoring its role as a catch-up material in mathematics education. Student evaluation and feedback also reflected high satisfaction with the factors mentioned. Recommendations for future research include longitudinal studies to assess long-term impact, comparative analyses with traditional textbooks, and exploration on future AI integration. This study contributes to the evolving literature on digital instructional materials, highlighting the potential of flipbook-based resources as catch-up material, to improve student engagement and academic achievement in mathematics education.



TABLE OF CONTENTS

	Page
TITLE PAGE	i
DEDICATION	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	v
TABLE OF CONTENTS	vii
LIST OF TABLES.....	ix
LIST OF FIGURES	x
 Chapter 1 The Problem and Literature Review	
Background of the Study	1
Literature Review	8
Theoretical or Conceptual Framework	22
Statement of Purpose	32
Significance of the Study	33
Scope and Limitations	34
Definition of Terms	35
 Chapter 2 Methods	
Research Design	37
Research Locale	38
Sampling and Participants	39



Instruments	41
Procedure	43
Ethical Considerations	46
Chapter 3 Results and Discussions	
Results	50
Chapter 4 Summary, Conclusions and Recommendations	
Summary of the Study	92
Summary of Results	93
Limitations	95
Conclusions	96
Recommendations	98
REFERENCES	100
APPENDICES	122
CURRICULUM VITAE	186



LIST OF TABLES

TABLES		PAGE
1	Grade 7 respondents of the Study	40
2	Grade 7 students' preferences in terms of the flipbook's theme	51
3	DepEd module's parts correspond to the Math Flipbook parts	55
4	Expert's evaluation on Math Flipbook in terms of five factors	65
5.	t-test results comparing test scores of grade 7 students before and after using Math Flipbook	77
6	Student's evaluation on Math Flipbook in terms of five factors	79



LIST OF FIGURES

FIGURES		PAGE
1	Research Paradigm	31
2	Procedural Flowchart of the Study	43
3	Flipbook's Parts Sequence	57



CHAPTER 1

THE PROBLEM AND LITERATURE REVIEW

Background of the Study

Mathematics plays a vital role in nurturing 21st-century skills such as critical thinking, logical reasoning, innovation, and collaboration. Its significance extends beyond the classroom, as it is intricately connected to various global initiatives.

In connection with the United Nations Sustainable Development Goals (UNSDG), mathematics empowers individuals with the necessary problem-solving abilities to address complex challenges in areas such as poverty reduction, quality education, and sustainable development (Lechuga, Faura & Martínez, 2020). Furthermore, in the era of the Fourth Industrial Revolution, mathematics stood as a foundational pillar supporting technological advancements, automation, and data analysis. It empowers individuals to navigate the digital landscape, make informed decisions, and contribute to transformative changes brought in by emerging technologies (Vinitha, Ambrose Prabhu, Bhaskar, & Hariharan, 2020; Hafni, Herman, Nurlaelah & Mustikasari, 2020). Within the ASEAN framework, mathematics education assumes an essential role in fostering a skilled workforce, promoting regional collaboration, and driving economic growth (Maamin, Maat, & Iksan, 2021).



However, the teaching and learning of mathematics presents significant challenges for both parents and teachers, worsened by the current learning crisis intensified by the pandemic.

Even before the pandemic, the education system dealt with low mathematics performance, notably caused by mathematics standards and curriculum (Ali & Jameel, 2016). Despite numerous innovative reforms aimed at elevating mathematics performance to international standards, most nations were still unlikely to meet the Sustainable Development Goal 4 objectives in reading and numeracy, as revealed by the Asia-Pacific's 5-Year Progress Review of SDG4-Education 2030 (UNESCO & UNICEF, 2021).

In an attempt to enhance the curriculum in the Philippines, K-12 Curriculum was introduced. Here, mathematics has been carefully designed to be more meaningful and relevant to students and educators alike, with topics aligned with students' abilities and the demands of the modern world (Department of Education [DepEd], 2012; Columbano, 2019). Despite these improvements, underachievement in mathematics persists, as evidenced by standardized assessments like the National Achievement Test (NAT) (Gonzales, 2019; DepEd Region 2, 2019), Programme for International Student Assessment (PISA) (OECD, 2018; DepEd, 2019), Trends in International Mathematics and Science Study (TIMSS) (Bernardo, 2020; Mullis, Martin, Foy, Kelly, & Fishbein, 2020), and Southeast Asia Primary Learning Metrics (SEA-PLM) (DepEd, UNICEF, Southeast Asia Ministers of Education Organization [SEAMEO], & Southeast Asia Primary Learning Metrics [SEA-PLM], 2021), where Philippines consistently flunked.



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

The advent of COVID-19 worsened this crisis, as underscored by Faingold, Chief of Education UNICEF Philippines, during the second webinar of the 8th Annual Public Policy Conference (APPC) (Philippine Institute for Development Studies [PIDS], 2022). Despite the Department of Education's (DepEd) development of the Basic Education-Learning Continuity Plan (BE-LCP) to provide learning opportunities during the pandemic (DepEd Order No. 12, 2020), education was disrupted, leading to learning loss and a broader and deeper learning crisis, especially in mathematics (e.g., DepEd Region 2, 2019; OECD, 2018; DepEd, 2019; Mullis, Martin, Foy, Kelly, & Fishbein, 2020; Bernardo, 2020; PIDS, 2022).

One of the severely affected learners in mathematics is those who are currently at Grade 7. The curriculum has fast-tracked concepts in the First Quarter Curriculum Guide, assuming that learners have already mastered fundamental concepts from earlier years in elementary level. Unfortunately, many of these students lack the necessary foundational knowledge, with one crucial area of deficiency being Operations on Integers.

The lack of mastery in this topic is a pressing concern. Proficiency in integer operations is a fundamental prerequisite for success in advanced mathematical concepts, such as algebra (Khalid & Embong, 2020, e.g., Herrera & Dio, 2016). This becomes particularly relevant in the context of the PISA Mathematical Framework, where the Philippines has faced challenges. It includes topics such as algebraic expression manipulation that necessitate skills in integer operations, as well as understanding of



integers within the context of quantity, number systems, and their algebraic properties (OECD, 2019; OECD 2023).

Moreover, within the TIMSS content domains, where the Philippines also encountered difficulties, the "Number" category encompasses the computation of negative numbers (Mullis, Martin, Foy, Kelly, & Fishbein, 2020).

The National Achievement Test (NAT) performance of students in grades 6, 10, and 12, consistently reveals lower proficiency levels in mathematics, particularly in topics related to Operations on Integers and related competencies (Gonzales, 2019; DepEd Region 2, 2019).

Moreover, ongoing quarterly item analysis further highlights the struggle with Operations on Integers and problem-solving involving real numbers, underscoring the urgency of strengthening students' proficiency in operations involving integers to enhance their overall mathematical competence.

In light of these challenges, mathematics educators are confronted with a dilemma. They must decide whether to prioritize the quality of instruction, ensuring a solid grasp of integer operations, or strictly adhere to the curriculum guide, potentially resulting in a higher number of students with limited mastery of these essential competency.

To address these learning issues, UNICEF, UNESCO, and the World Bank jointly developed the RAPID framework, a flexible Learning Recovery Framework comprising five components: R-Reach every child and retain them in school; A-Assess learning levels; P- Prioritize teaching the fundamentals; I- Increase catch-up learning and progress beyond



what was lost; D-Develop psychological health and well-being to ensure every child is ready to learn. Under the "I-Increase" component, the framework suggests that the education system should assist teachers and schools in implementing effective catch-up strategies that have a measurable positive impact on student learning, such as self-guided learning complemented by technology (UNICEF, 2022).

The Philippines has aligned with this framework by formulating the Basic Education Development Plan (BEDP) 2030, which comprises two phases. Phase 1 focuses on addressing the effects of COVID-19 on issues related to numeracy, reading skills, learning delivery, and the devolution of projects, programs, and activities (PPAs). Phase 2 concentrates on maintaining gains, institutionalizing projects for the future of education, and fostering new educational technologies and innovations (DepEd, 2022).

In line with the "I-Increase" component of the RAPID Framework and BEDP 2030, it is imperative to address issues concerning educational modules in basic education particularly in the context of classroom-based catch-up strategies, promoting and motivating self-guided learning, and mitigating the effects of COVID-19 (e.g. Pe Dangle, 2020; Gueta & Janer, 2021; Meniano & Tan, 2022). Key issues encompass the lack of interactive and engaging content in traditional educational modules, which can diminish student interest and participation (Capindig, 2022)

By harnessing emerging technologies and innovations, such as Interactive Self-Learning Modules (ISLMs), it is possible to help in addressing these issues and provide a more effective and inclusive educational experience for students.



Interactive Self-Learning Modules (ISLMs) represent an application of educational technology with the potential to facilitate the educational process, adapting to the cognitive growth rate and contemporary trends observed among the new generation of students (Antigua, 2017; Lapie, Lawas & Lawas, 2015). These modules serve as self-contained educational tools that present opportunities for experiential learning, incorporating interactive exercises, simulations, and educational games (Kim, Williams & Datillo, 2002). This kind of modules offer a setting where students can engage in the learning activity and learn through viewing animation or visual content (Jamwal, 2012).

ISLMs have consistently demonstrated a favorable impact on education in various fields, encompassing english (e.g., Jais, Ishak & Yunus, 2022), medicine (e.g., Gaikwad & Tankhiwale, 2014), and mathematics (e.g., Lapie, Lawas & Lawas, 2015; Antigua, 2017; Rondillas & Buan, 2019; Columbano, 2019). In the context of mathematics, the utilization of ISLMs has garnered not only the endorsement of subject matter experts but has also resonated with students due to its characteristics that the usual printed books cannot provide (Rondillas & Buan, 2019).

Furthermore, the advancement of technology has opened endless possibilities for improving ISLMs. The development of software has been prompted by the increased use of computers and the internet (Yalman, 2015). Digital technology empowers educators to explore innovative approaches to teaching and learning mathematics, offering technologies like flipbook media that employ 3-Dimensional page flipping and are deemed effective in addressing student learning challenges due to their rich array of features compared to



printed books (Arsyad, 2011). Flipbook multimedia enhances student understanding (Andini, Budiyo, & Fitriana, 2018) and help students develop their comprehension of concepts with constructivism-based mathematics module (Jazim, Anwar & Rahmawati, 2017)

Despite the positive impact on education, most ISLMs have not been thoroughly tested in actual teaching and learning processes. Additionally, students using ISLMs have encountered technical problems (Rondillas & Buan, 2019) and certain limitations (Antigua, 2017) that can still be improved.

Moreover, many studies have not considered learners' preferences in terms of the ISLM's content design, which should ideally align with students' interests and involve them in the module's preparation process, as they are the end-users (Makonye & Fakude, 2016).

The end-user satisfaction and involvement, on the other hand, is the Agile Model primary concern (Boehman & Turner, 2003). Proven effective in managing software development, this model has been suggested for adaptation in educational settings (Dewi & Muniandy, 2014). Unlike other development models that strictly follow a sequence, the Agile Model prioritizes the capacity to manage constant change, making it flexible (Sacolick, 2022). In 2018, it was predicted to play a significant role alongside emerging technology trends (Hoda et al., 2018), and that future is unfolding now.

In light of the above considerations, this study envisions students reclaiming their learning losses caused by the pandemic and conquering underachievement in mathematics through the development of Flipbook, an Interactive Self-Learning Module, a catch-up



strategy focusing on operations on integers, was created using the Agile Model, with a digital design personalized to students' theme preferences while addressing issues identified in previous ISLM research because addressing this loss in education is a crucial prerequisite for learner's academic success, eventual integration into the workforce, and ability to participate fully in society.

Literature Review

Before the onset of the pandemic, Philippine education faced a persistent challenge – underachievement, notably in mathematics, with a specific focus on mastering operations involving integers. This issue garnered attention due to consistent subpar performances in standardized assessments like the NAT, PISA, and TIMSS, where the Philippines consistently flunked.

Operations on Integers

In the K-12 curriculum, mastering Operations on Integers is emphasized in both Grade 6 and Grade 7, with a greater focus on Grade 6 and a streamlined review in Grade 7 to serve as a foundation for advanced mathematical concepts (DepEd, 2020). However, a significant number of students lack essential foundational understanding of this competency in Grade 7. Despite appearing simple, performing operations on integers often poses challenges and confusion for students (Alsina & Nelson, 2006; Khalid & Embong, 2020).

Challenges in mastering basic operations involving signed numbers, particularly addition and subtraction, have been extensively researched worldwide as early as 1988.



Various teaching approaches, such as dice (Linchenovski & Williams, 1988) and integer tiles (Hayes & Stacey, 1998), the "jar model" (Badarudin & Khalid, 2009), Chinese "Tai ji" or "Yin-Yan" (Egan, 1997), colored counters, and virtual manipulatives (Goh, Tengah, Shahrill, Tan, & Leong, 2017), have been explored, with many yielding positive results, though some students still encounter difficulties even after these interventions.

This challenge also arises from the spiral nature of the Philippines' mathematics curriculum, worsened by pandemic, resulting in inadequate mastery of Operations on Integers. This deficiency has far-reaching consequences, as it impedes students' ability to comprehend other subject areas that rely on these foundational skills (Domanais, 2019).

Despite the mentioned efforts, challenges persist, as students often struggle with integer operations (Makonye & Fakude, 2016; Khalid, Othman, Ibrahim, & Embong, 2018), as evidenced by school-based, national, and international assessments.

Assessment Challenges Involving Operations on Integers

In the Philippines, the PISA Mathematical Framework has presented significant challenges. This framework encompasses a wide range of subjects, including the manipulation of algebraic expressions, which requires a strong foundation in integer operations. Moreover, it provides a comprehensive exploration of integers within the broader context of quantity, number systems, and their intricate algebraic properties (OECD, 2019; OECD 2023).

Additionally, TIMSS, where our country has encountered its own set of challenges, one of its content domains is "Number." This domain includes the computation of negative



numbers, a topic that has proven to be particularly challenging for Filipino students (Mullis, Martin, Foy, Kelly, & Fishbein, 2020).

Furthermore, within our country, ongoing assessments, such as the National Achievement Test (NAT), consistently reveal lower proficiency levels in Mathematics among students in grades 6, 10, and 12. This performance gap is especially pronounced in topics related to Operations on Integers and associated competencies (Gonzales, 2019; DepEd Region 2, 2019).

These challenges highlight the ongoing need for addressing difficulties related to integer operations and negative numbers in mathematics education, especially in the context of these assessments.

Proficiency in integer operations serves as a fundamental prerequisite for excelling in advanced mathematical concepts, as affirmed by Khalid and Embong (2020). In their examination of the necessary competencies for successful learning in Grade 11 General Mathematics, Herrera and Dio (2016) identified performing operations on integers as one of these essential competencies. This solid grasp of integer operations not only lays the groundwork for comprehending but also for effectively applying advanced mathematical concepts and problem-solving techniques.

However, the outbreak of the COVID-19 pandemic exacerbated the existing learning crisis, leading to school closures and significant disruptions in education. In response to these unprecedented challenges, collaborative efforts between UNICEF, UNESCO, the World Bank, and the Department of Education (DepEd) resulted in the



development of frameworks and plans designed to address the educational impact of COVID-19 and adapt to the new normal.

Drawing from the guiding principles outlined in the RAPID Framework and BEDP 2030, which prioritize classroom-based catch-up strategies and aim to tackle the specific challenges brought about by the pandemic, along with the development of innovative educational technologies, there exists an opportunity to help in mitigating the issues associated with learning loss and underachievement. One such catch-up strategy that aligns with these principles is the implementation of Interactive Self-Learning Modules, rooted in a modular approach.

Modular Approach

The modular approach to education has gained prominence in recent times, and its effectiveness has been recognized in various academic contexts. This personalized instructional method fosters close interaction between students and course content, allowing learners to engage with the material at their own pace through the use of instructional modules (Hughes, 1963).

Notably, during the COVID-19 pandemic, modular learning became the predominant approach in public schools. A survey conducted by the Department of Education (DepEd) revealed that approximately 8.8 million Filipino parents favored modular learning due to its convenience, prompting educational authorities to implement this approach in remote areas (Magsambol, 2020).



The modular method has been adopted across numerous subjects, predating the pandemic's onset. While it draws from the principles of programmed learning, it has evolved into a well-established and widely acknowledged educational phenomenon (De Jesus, 2005; Sejpal, 2013; Trapane, 2016), including its application in mathematics teaching (Alcantara, 2015).

In the realm of applied sciences and mathematics, the modular approach has demonstrated its efficacy in enhancing the academic achievements of students, particularly those who may require additional support, such as slower learners (Columbano, 2019). This approach empowers students to grasp fundamental principles, tackle problems, and navigate procedures through hands-on activities, data observation, and analysis, ultimately leading to comprehensive understanding and generalization (Dooley and Swanberg, 1989).

Research has consistently shown that employing a modular approach to mathematics instruction can be an effective means of enabling students to independently grasp the subject matter. While the development of educational materials using this approach can be time-intensive, its effectiveness has been substantiated (Trapane, 2016).

One particularly effective method of individualized education within the modular approach is the utilization of self-learning modules in classroom settings (Sadiq & Zamir, 2014). Paspasan (2015) conducted a comparative study between the Self-Paced Modular Approach (SPMA) and a structured approach, concluding that students utilizing SPMA displayed greater independence in their learning styles, as they preferred to work at their



own pace. Consequently, SPMA contributed to enhanced performance levels in Plane Trigonometry compared to the structured approach.

Amid the COVID-19 pandemic, modular distance learning had a significant impact on high school learners' motivation, achievement, interest, and anxiety levels, particularly in mathematics education (Capinding, 2022). Surprisingly, learners reported high levels of motivation, passion, and a favorable attitude towards mathematics when utilizing this approach. Notably, negative correlations were observed between anxiety and motivation, as well as interest and anxiety. Conversely, positive correlations were noted between motivation, achievement, and interest, underscoring the importance of developing learning modules that are not only educational but also engaging and appealing to users.

However, modular learning, particularly through self-learning modules, presented challenges related to mathematics comprehension aside from motivation and interest problem. These difficulties often stemmed from the abstract nature of mathematical concepts, students' lack of prerequisite knowledge, and limitations in the examples provided in the modules, which did not always align with the assigned activities. Research findings by Meniano & Tan (2022), consistent with the studies of Pe Dangle (2020) and Gueta & Janer (2021), emphasized that while modular distance learning offers advantages, it necessitates the provision of essential learning materials to ensure quality education.

To address these challenges within the modular approach, this study developed educational material that not only captivates users but also enhance students' motivation and interest, even with minimal teacher intervention. The developed material maintained



coherence across its objectives, discussions, examples, and assessments, thereby facilitating students' mastery of basic concepts. Through the developed Modular Learning Materials (MDL), students can cultivate their capacity for independent learning, self-determination, and self-reliance, essential skills for their personal and real-life development.

Nature and Characteristics of Interactive Self-Learning Module (ISLM)

Interactive Self-Learning Modules or simply Interactive Learning Modules, are application of educational technology (Antigua, 2017) that can facilitate teaching and learning process to conform with the trend and rate of cognitive growth in the new generation of students (Lapie, Lawas & Lawas, 2015). These are self-contained instructional modules that provide chances for experiential learning that includes engaging exercises, simulations, and games (Kim, Williams & Datillo, 2002).

One defining feature of ISLMs is interactivity, which plays a crucial role in fostering effective learning experiences (Stout, Villegas, & Kim, 2001; Cifuentes, 2001). This interactivity extends to various aspects of learning, including collaborative discussions through platforms like Google Groups, Google Sheets, and Wiki spaces, the incorporation of digital content via hyperlinks, and the use of multimedia elements such as simulations, animations, and videos, and even immediate feedback (Jamwal, 2012).

Multimedia elements, particularly digital videos, have been recognized as valuable tools for enhancing mathematical education (Niess and Walker, 2010). These videos contribute to the development of students' visualization, reasoning, and communication



skills, providing exposure to diverse mathematical approaches and encouraging critical thinking.

Furthermore, ISLMs offer immediate feedback mechanisms that positively impact student learning. Research by Rakoczy, Pinger, Hochweber, Klieme, Schütze & Besser (2019) highlights the value of formative assessments and feedback in enhancing students' self-efficacy and interest. Immediate feedback, as demonstrated by Razzaq, Ostrow & Heffernan (2020), benefits students with varying levels of prior knowledge, ultimately leading to improved learning outcomes.

While ISLMs leverage technological advancements, they also retain the characteristics of traditional printed modules. These include briefness to optimize study time, a focus on specific skills or outcomes, self-teaching capabilities with room for collaboration, integration of theory and practice, supplementary materials, and provisions for student engagement in project design and assessment (Nepomuceno as cited by Yazon, 2018).

However, in the digital age, the importance of interactive materials in e-learning cannot be overstated. The ability to use and create interactive learning modules enhances the flexibility and student-friendliness of education, promoting collaboration and knowledge exchange among students. Moreover, this approach aligns with the acquisition of 21st-century skills necessary for success in the modern world. (Mwaniki, Njihia, Chege & Ireri, 2016).



The creation of ILMs as learning resources in various fields of expertise is a current trend. Education professionals, academic researchers, and even students are investigating the possibility that ILMs might be utilized as a strategy to encourage, motivate, and improved academic performance of students in mathematics (Jamwal, 2012; Antigua, 2017) which is the major aim of this study.

Advantages of Using Interactive Self-Learning Module (ISLM)

Learning involves engaging interactions that give people power, and ICT-based instruction can significantly aid both teachers in delivering content and students in comprehending it. The improvement and efficiency of learning attributed to ISLM stem from its nature and characteristics, making these interactive teaching tools not only educational but also sources of joy and comfort for students. They embody creativity, originality, and adaptability in alignment with technological advancements (Wijaya & Vidianti, 2020).

One of the most prominent benefits of ISLM is its capacity to enhance students' academic performance. The impact of ISLM on education transcends various fields and subjects, such as English. Jais, Ishak & Yunus (2022) illustrated this by developing interactive self-learning modules using Microsoft PowerPoint Presentation as enrichment activities to aid students in becoming effective learners. The results highlighted an improved understanding of English tenses, increased confidence in their usage, and a strong desire among students to adopt this style of learning for other subjects.



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

Similarly, in the realm of English Mathematics Profession, Evenddy, Hamer, Pujiastuti & Haryadi (2021) introduced a 3-Dimensional e-learning Flipbook module, further demonstrating the efficacy of ISLM. The module's positive impact on academic performance and its practicality in academic settings underline its value.

In medical education, Gaikwad & Tankhiwale (2014) conducted a study using interactive e-learning modules created with Microsoft PowerPoint Presentation to enhance active learning in the field of pharmacology. This approach significantly boosted student scores and received high praise for its creativity, practicality, adaptability, and overall value, especially in rural settings.

Mathematics education also benefited greatly from ISLM, as evidenced by Rondillas & Buan's (2019) study, which incorporated financial literacy into teaching fractions and decimals using an interactive module. The integration of videos, interactive websites, and online assessments proved instrumental in enhancing student achievement.

Furthermore, ISLMs positively influenced students' problem-solving abilities requiring various forms of mathematical reasoning (Kaplar, Radovic, Veljkovic, Simic-Muller, & Maric, 2021). The inclusion of multimedia elements and subject matter integration, such as video, animation, text, images, and simulations, in e-content contributed to increased student success in mathematics (Prabakaran & Saravanakumar, 2020).

The Department of Science and Technology (DOST) partnered with educational institutions to develop Mathematics Courseware, interactive computer-assisted modules



aligned with the K–12 Mathematics Department of Education's Curriculum. These modules, with localized content, are currently employed as effective teaching aids, benefiting Filipino students (Antigua, 2017).

During the pandemic, San Mateo (2021) tested the efficacy of DOST Mathematics Courseware modules as remediation materials for Grade 10 Mathematics. The modules proved effective, enhancing students' mastery of previously challenging competencies.

Aside from testing the effectiveness of the ISLM, many researches dealt with the development of ISLM that focuses and considered the end-user's and expert's evaluation. These researches that developed ISLM gained evaluators', but most importantly, student's affirmation. The study of Setiyani, Putri, Ferdianto, & Fauji (2020), designed an e-module having mathematical communication skills of the students as basis. The development of a digital teaching module employing media is one approach taken to address problems on usage inferior learning materials and low comprehension of students in mathematical concepts related to relations and functions. Based on the experts and students evaluation, it was concluded that students' learning independence can be increased with the use of the proposed digital module because it can be used outside the classroom without maximum supervision.

Fachrunisa, Kuncoro & Arigiyati (2022) who developed a mathematics e-learning product specifically a flipbook that can be opened through android with the aid of an application for Grade 7 students. Experts' and students' validation revealed that this material is viable and practical to be employed in the mathematics learning process.



Furthermore, with the use of ISLM, inclusion of beautification elements is possible like insertion of theme such as comics or cartoons which is deemed effective as material for instruction. Mathematical concepts must be presented in a way that has significance for the learners to inspire them to study and absorb the subject. Author Tin Toh (as cited by Antigue, 2017), who was active in Singapore's mathematics education program, incorporated the use of cartoons in the instruction of algebra. He stated that students may be introduced to the realm of algebra by repeated exposure to cartoons and comics that employ the algebraic language. The learners' anxiety of using letters to represent numbers will diminish via regular exposure with this strategy, as he claimed.

Interactive Self-Learning Module has endless possibilities, which this study indulged to, with the use of technology that is beneficial to the students which traditional module could not provide.

Improvements Needed in Current Interactive Self-Learning Module (ISLM)

However, no technology is perfect, in the researches, ISLM can still be improve to maximize its potential.

Developing ISLM required careful planning, who would think that this kind of learning material being interactive can also bring boredom to the students.

Too much indulgement in beautification elements is a drawback. Lapie, Lawas & Lawas (2015) developed and validated interactive learning module on summation notation as specific topic incorporating comics or anime as its theme. Since more pictures and



animations were used to fit with the theme, ILM's design may have enhanced its aesthetic appeal based on the students' evaluation however, this method resulted in more character conversations being included. There were a lot of narrations and texts, which, along with the ILM's poor average, gave the impression that it was "wordy" and "boring." That is why it is suggested to lessen the amount of character conversation.

Another consideration on the integration of beautification elements, specifically on the use of comics and cartoons, even though deemed effective, not all cartoons may be considered useful teaching tools. Cho (2012) asserted in the study involving grade 7 learners, that the cartoons should promote meaningful learning, offer positive impact and an acceptable amount of challenge, foster a setting in the classroom that encourages student autonomy, and highlight the value of mathematics in everyday life. Therefore, choosing material theme is critical, it is essential that the integration of such a learning medium be familiar to the students or better if the same age as them (Obias, 2012) and related to the subject matter.

Extra quizzes or games in the ISLM were also suggested by the student-respondents (Bolivar 2013; Lapie, Lawas & Lawas, 2015; Antigua, 2017) because the majority of their interests in using ISLM depend on its capacity to deliver interactivity.

Additionally, it was recommended that Filipino be utilized as the instruction's medium and that audio be added. However, since Filipino is not usually spoken, language use might be improved to a level that the target learners can readily understand. (Lapie, Lawas & Lawas, 2015)



Moreover, online version of ISLM is better than offline. In the previously mentioned study in 3D flipbook created by Evenddy, Hamer, Pujiastuti & Haryadi (2021) which can be used online and offline, validation and evaluation performed have shown disadvantages of using offline 3D flipbook than that of online. The researchers stipulated that using the material online gives better experience to the learners because if the user is unsure on the accessible information specifics, the offered internet links might connect the users to web pages offering further explanation and information. Meanwhile, using the material offline, the information presented is compounded to simply what has been upload by the developer.

Lastly, technical issues arose in those ISLM created offline using PowerPoint Presentation. These are in opening of the link embedded in the module, the compatibility of the interactive module in one's computer or laptop, and too large file size leading to limited animations, audios and videos incorporated in the module (Antigua, 2017; Rondillas & Buan, 2019)

Synthesis

The ongoing challenges in mathematics education, particularly in mastering Operations on Integers, have been worsened by the COVID-19 pandemic, leading to significant learning loss and underachievement. The need for effective catch-up strategies is paramount, and Flipbook, an Interactive Self-Learning Module (ISLM), the end-product of this study, emerges as a promising strategy as suggested by authorities.



As evidenced by numerous studies, ISLMs have shown efficacy not only in mathematics but also in various educational fields. However, it's important to note that there is no perfect technological product, and continuous improvements are necessary.

The focus on Operations on Integers within flipbook is a critical step in addressing the specific challenges that students face in mastering this fundamental mathematical competency. By leveraging technology and adopting a modular approach, flipbook provides targeted support to students, helping them overcome difficulties in integer operations. With advancements in technology, there is ample opportunity to enhance these modules further.

In conclusion, the journey toward effective mathematics education is an ongoing one, and flipbook offer a path forward. These modules have the potential to inspire teachers to be inventive and creative in developing engaging and enjoyable media that equips students to conquer underachievement, particularly in Operations on Integers

Conceptual Framework

This study is grounded in a synthesis of relevant theories, frameworks, and models, which collectively inform the research objectives and guide the investigation into the use of Flipbook, an Interactive Self-Learning Module (ISLM), as a strategy to help in addressing mathematics underachievement during and after the pandemic, with a specific focus on operations on integers.



Before the pandemic, mathematics underachievement persisted despite curriculum revisions and educational reforms aimed at meeting international standards. The learning crisis in mathematics worsened during the pandemic due to widespread school closures. While the Department of Education made efforts to continue learning in this unprecedented situation, there was a need for additional strategies to mitigate the impact of the pandemic on education. To help in addressing the issue, UNICEF, UNESCO, and World Bank give a learning recovery framework, RAPID Framework, in which DepEd adheres to with its BEDP 2030, these are where the main idea of this study came from.

RAPID Framework

In order to assist nations in developing learning recovery plans, UNICEF, UNESCO, and World Bank developed a Learning Recovery Framework, a flexible framework to aid nations in planning for the learning recovery. This Recovery Framework has 5 components with an acronym RAPID, namely: R-Reach every child and retain them in school; (2) A-Assess learning levels; (3) P- Prioritize teaching the fundamentals; (4) I-Increase catch-up learning and progress beyond what was lost (5) D-Develop psychological health and well-being so every child is ready to learn. This framework suggests that recovery tactics, such as self-guided learning programs and small group tutoring, can be used to reinforce classroom instruction. Self-guided programs, which can be delivered using paper and pencil or computer-assisted, frequently adaptive programs, allow pupils to advance at their own pace. (UNESCO, 2022).



The RAPID framework emphasizes the importance of recovery tactics such as self-guided learning programs and small group tutoring, its principles align with the principles of ISLMs. These programs allow students to learn at their own pace, which is consistent with the self-paced nature of ISLMs (UNESCO, 2022), that is the end-product of this study.

Basic Education Development Plan (BEDP) 2030

In the Philippines, Department of Education, formulate Basic Education Development Plan (BEDP) 2030, the first comprehensive basic education plan that includes both formal and informal education learners from five to eighteen. It serves as a strategic road map for increasing the standard for fundamental education and improving the efficiency of the learning environment for students. It is composed of two phases. The first phase will concentrate on the immediate impacts of Covid-19 on participation and learning, on the other hand, the second phase will concentrate on maintaining the benefits, evaluating the programs, and designing innovative educational technology. (DepEd, 2022).

The aim of this study aligned with the goals of the Basic Education Development Plan (BEDP) 2030 by addressing the pressing educational needs worsened by the pandemic, offering an innovative and technology-integrated solution and thereby will help in postering sustainability and enhancing the quality of basic education in the Philippines.

With the RAPID Framework and BEDP 2030's principles which are targeting the idea in I-Increase, focusing in the classroom-based catch-up strategy, and concentrating on the effect of COVID 19, and designing innovative educational technology, learning loss,



underachievement, and low mastery problem, especially in Operations on Integers that is prerequisite of higher mathematics, could at least be lessen if not be solved. One catch-up strategy that conforms to these principles is Flipbook, an Interactive Self-Learning Module, which is the end-product of this study.

Constructivism

This flipbook, the end-product of this study, is anchored to constructivism, that has a fundamental feature that learning is an active process in which students build on their prior and present knowledge to create new ideas or concepts (Ayaz & Şekerci, 2015). In mathematics, constructivism is an approach in education that emphasizes how learners build their own understanding and knowledge from their experiences rather of having teachers lecture or explain complicated mathematical concepts (Bruner, 1986). This method sets role for teachers (e.g. Kim, 2005; Taylor, Fraser and Fisher, 1997; Holt-Reynolds, 2000) and students (e.g. Bruner, 1986) to help the former develop their critical thinking skills.

Behaviorism: Keller's Personalized System of Instruction (PSI)

Learning Modules like flipbook is self-paced, may include reading assignments, movies to watch or listen to, pre-recorded lessons, performing experiments or interviews, and more. Performance reviews may include essays, multiple-choice questions, oral examinations, written reports and others. Although not compulsory, extra points are suggested for students who finish their tasks on time because procrastination is the main issue with self-paced courses. All of these characteristics fall under the Keller's



Personalized System of Instruction (PSI) which rely heavily on the behavioral principles that focused on overt behavior (Ng'andu, Hambulo, Haambokoma & Milingo, 2013), and incorporated into current instructional design approaches (Ertmer & Newby, 2013). The author, Keller (1968) identified five key features of PSI.

The first feature, self-pacing, it enables a student to complete the course at a rate appropriate to his or her ability and other time commitments. In this case regular classes of the students will not be affected. The next feature is the use of proctor, allows for frequent testing, fast feedback, nearly mandatory coaching, and a significant improvement in the personal-social component of learning. The third feature is mastery of course material, only when the student has proven that he or she have mastered the previous content, he or she can move to the next. The fourth is stress upon the written word, mainly the conversation of teacher and student is done through written words. Here, instead of being viewed as a person who teaches information, a teacher is viewed as a learning facilitator. Lastly, demonstrations and lectures are mainly a vehicle for motivation.

E-learning Theory

However, development of this kind of module is not easy and may need to embed guiding principles like the principles of E-learning Theory. E-learning theory created a collection of multimedia instructional design concepts that support efficient learning in scientific literature (Mayer, 2014). Through technology and providing positive feedback, this theory helps learners to integrate their learning and progress the implementation of schools (Moreno, 2006). It can be used to instructional design as it demonstrates how to



use and create instructional technologies to encourage successful learning (Wang, 2012) in its 11 principles namely: (1) Multimedia principle: utilizing two audio, visual, and text forms as opposed to one or three; (2) Modality principle: Replacing on-screen text with audio narration to explain visual material; (3) Coherence principle: Avoiding pointless audio and video; (4) Contiguity principle: Synchronizing related information with corresponding images; (5) Segmenting principle: Managing complex material by dividing a lecture into manageable chunks; (6) Signaling principle: Offering arrows, circles, and other narrator-indicating symbols; (7) Learner control principle: Learning pace is under the learner's control; (8) Personalization principle: Presenting language in a casual, conversational manner; (9) Pre-training principle: Preceding a lesson's primary procedure, giving a lesson's key concept; (10) Redundancy principle: Displaying images with either audio or text on-screen but not both; and (11) Expertise effect: Keeping in mind that learners with varied levels of prior knowledge may respond differently to design principles (Mayer, 2003; Mayer & Moreno, 2003; Mayer, Moreno & Sweller, 2015; Clark & Mayer, 2016).

Minding this principle, while developing the flipbook, was beneficial in enhancing the learning experience and aligned with modern educational technology trends.

Agile Development Model

Moreover, guiding principles is not enough because developing flipbook, ISLM must be planned carefully in order to maximize its potential and serve its purpose. Following a certain model like Agile Model is a great help.



Agile model is gradual and iterative, and it allows the modification of requirements in response to end-user's needs. Adaptive planning, iterative development, and time boxing are all aided by this model. It is a theoretical framework that promotes anticipated interactions throughout the whole developmental process (Sharma, et al., 2012). It is a process itself (Ahmed et al., 2010) having its end-user's satisfaction as the primary concern and directly involved in evaluation (Boehman & Turner, 2003).

Agile is the capacity to innovate and adapt to change. It is a strategy for surviving in a complicated and chaotic environment and eventually thriving there. The Agile Manifesto's authors decided to call the entire idea "Agile" because it encapsulated the flexibility and capacity for change that were essential to their strategy. (Agile Alliance, 2022). This method came from the idea of waterfall method however, instead of being forced to adhere to a conventional waterfall development method, that has a strict sequence, this model placed an emphasis on the capacity to manage constant change making it flexible (Sacolick, 2022).

The software development life cycle is adhered to by the agile technique, namely: requirements analysis, design, development, testing, and deployment of partially implemented software for the feedback from its end user, since their satisfaction is being prioritized. There is no strict sequence to be followed. It is flexible and evolving unlike the waterfall method, as mentioned.

The first from the list is requirement analysis. This is the phase where the team collects necessary information for the development of the project like who will be the end-



user of the product, their characteristics and how they will use it. The second one is design. When the idea becomes feasible and viable, then the team will now work by assigning and prioritizing them to different possible iterations. Here solutions to the problem from the first phase will be designed, including test strategy. After the design phase, the features are now to be implemented in the development phase. Testing phase is next after developing, the product is being tested first against the requirements and lastly the deployment phase, this is the point where the product is being delivered to the end-users. This does not guarantee the end of the project because from here another requirement may arise. (Salza, et al., 2019).

Because Agile approaches have proven to be effective in managing software development, numerous studies have suggested adapting them to the educational setting (Dewi & Muniandy, 2014). In fact, the application of Agile in K-12 settings is widely described (e.g. Fronza, Ioini & Corral, 2017; Kastl, Kiesmüller, & Romeike, 2016; Meerbaum-Salant & Hazzan, 2010; Romeike & Göttel, 2012) For example, Fronza et al. (2017) outlined the development and use of an educational framework based on Agile principles that uses animations and Scratch to teach computational thinking abilities. Other researches also provide evidence on the Agile's effectiveness in online learning (e.g. Ashraf, Shamail, Rana, 2012; Noguera, Guerrero-Roldán, & Masó, 2018; Vivian, Falkner & Falkner, 2013). Noguera et al. (2018), stipulated that implementing Agile methods in online courses helped students improve their learning process.



A review conducted by Salza et al. (2019) revealed that 83.5% of the papers from different scientific publications in computer science refers to Agile as methodology for teaching and learning; however, 91.5% were applied in teaching and learning Computer Science and Software Engineering, which is not surprising, and only 8.5% in other fields like mathematics.

Agile Methodology has been predicted to have a strong role together with emerging trends in technology in the future (Hoda et al., 2018). With today's technological breakthroughs, huge volumes of data are becoming available for analysis, and a variety of tools are being developed to help with this. Systems for virtual and augmented reality are being created, and intelligent solutions are becoming more common. Simultaneously, these new technologies have rekindled interest and opened up new avenues for fully realizing the potential of paradigms like end-user development in various fields including education (Segal & Morris, 2008).

The Agile Model, known for its adaptability and iterative nature, can inform the development and improvement of ISLMs. Agile principles, including adaptive planning, iterative development, and end-user satisfaction, are relevant to the ongoing enhancement of ISLMs which is relevant in this study.

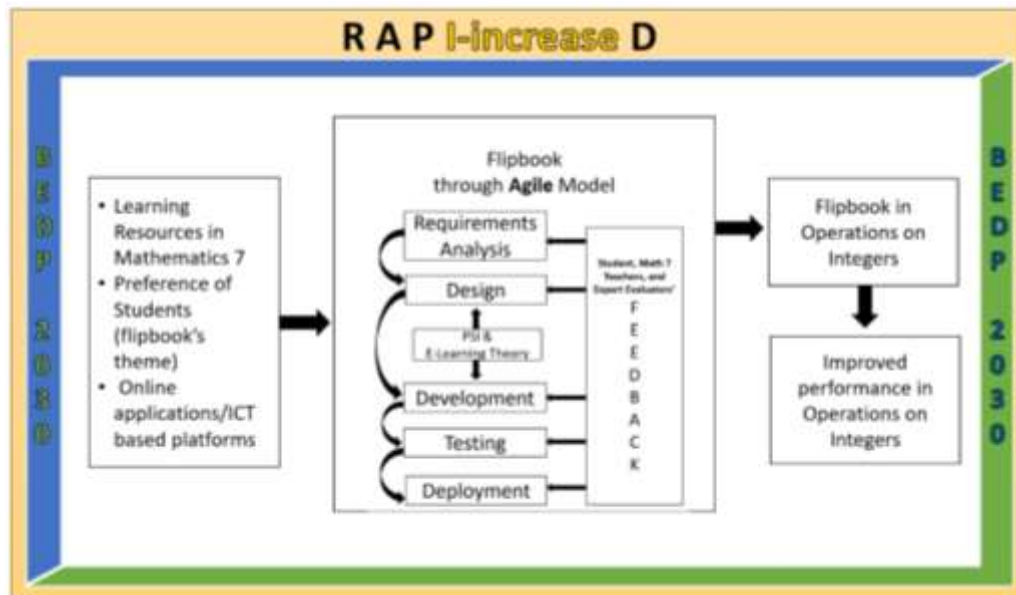


Figure 1. Research Paradigm

This study was primarily aligned with the "I-Increase" component of the RAPID Framework, developed by UNICEF, UNESCO, and the World Bank. BEDP 2030, formulated by the Department of Education (DepEd), is grounded in a similar framework, and this study aligns with its two phases as well.

Building upon the principles of this framework and plan, with the use of Learning Resources in Mathematics 7, Preference of Students (flipbook's theme), and Online application/ICT based platforms, an improved performance in Operations on Integers using a developed and validated Flipbook was expected through the process of Agile Model.

The researcher adopted the Agile Model, starting from Requirements Analysis where the researcher conducted a survey to determine students' preference in terms of flipbook's theme. After that, the researcher designed the flipbook based on student's theme preference, which constitutes the Design Phase. This was immediately followed by the



Development Phase or simply the actual development of the flipbook applying all the information in the previous two phases. The principles of PSI and E-Learning Theory were considered in Design and Development Phases. After the development, the researcher tested (Test Phase) the developed Math Flipbook that serves as the internal validation, feedback and suggestions of the evaluators were applied for its improvement before deploying (Deployment Phase) it to the students for external validation.

Statement of Purpose

This undertaking primarily aimed to improve the student's performance in Operations on Integers using flipbook through Agile Model.

Specifically, this study pursued to:

1. Design the flipbook based on students' theme preference.
2. Develop flipbook in operations on integers
3. Establish the validity and reliability of the flipbook in terms of content quality, instructional quality, technical quality, and usability characteristics:
 - a. Multimedia Design
 - b. Overall Interface
 - c. Behavior of Controls System Information
 - d. Customizability/Support for User Preferences
 - e. Hyperlinks



Significance of the Study

This study serves as a tool in increasing the catch-up learning in gaining the learning loss and underachievement in mathematics brought and worsen by the pandemic, respectively, focusing in operations on integers.

Students benefit from the use of flipbook in learning operations on integers as they be able to catch the learning that they have lost due to the pandemic, allowing them to advance at their own pace. The students get the chance to independently explore and learn the information since it is designed to be student-centered and designed in accordance with their theme preference. Additionally, the findings of this study raise their awareness on the methods that might stimulate their interest in studying mathematics.

For teachers, they can use the flipbook at their own classes to aid the learning of students in Mathematics 7. The results of this study can motivate them to design their own interactive module with the needs and preferences of the students in mind. Additionally, the findings and results of this study may be used and utilized to help teachers decide whether to utilize interactive modules in the teaching of mathematics.

For school administrators, they may consider the study's findings in terms of interactive module's effectiveness in learning mathematics. They are given a basis to further motivate or discourage teachers from creating Internet-based activities in improving the learning process.

To the curriculum developers, this research provides them with different instructional models that might aid in removing obstacles and constraints to effective,



efficient learning, in gaining the learning loss brought by the pandemic and in fighting underachievement in mathematics.

Lastly, this study holds the potential to offer valuable insights into the efficacy of educational technology, with a specific focus on the utilization of ISLMs as learning materials in mathematics education. It aims to address the learning crisis exacerbated by the pandemic, recognizing that proficient math skills are not only essential for academic success but also for future integration into the workforce and full participation in society.

Scope and Limitations

This study was limited to improving the student's performance in Operations on Integers using flipbook following Agile Model. The developed material is specifically responsive to the needs of Grade 7 students for S.Y 2023-2024.

The preference of the students in terms of the module's theme was employed to the design of the interactive module.

Both subject matter experts and the Grade 7 students evaluated the developed interactive module in terms of Content Quality, Instructional Quality, Technical Quality, and Usability Characteristics limited to Multimedia Design, Overall Interface, Behavior of Controls System Information, Customizability/Support for User Preferences, and Hyperlinks.

Lastly, the developed Math Flipbook was only available online.



Definition of Terms

For clearer facilitation of understanding, the following terms are conceptually and operationally defined for the aim of clarifying their meanings as used in this study.

Development. It describes the process of creating educational procedures, products, and programs that must adhere to internal consistency and effectiveness standards (Richey, 1994). In this study, this denotes as the process of creating the Math Flipbook or the Interactive Self-Learning Module in operations on integers following Agile Model.

Flipbook. Flipbook, in digital age, is a digital book having a 3-dimensional e-book technology display design. Its pages may be flipped like reading a book on a monitor because of a digital book display design. (Abror, Suriani & Tri Ardianto, 2019). A flipbook is a type of conventional digital PDF that displays content left to right and typically has some sort of page-flipping animation, as opposed to the scrolling nature of a PDF document. It mimics the layout of a print publication (such as magazines, catalogs, brochures, and more) or traditional digital publication. By utilizing elements offered by the larger web, the flipbook concept aimed to provide a more interesting and interactive digital experience that may go beyond merely possessing a digital copy. (McBride, 2020). In this study, this word is used and included in the product's name for the product takes its characteristics like the flipping effect, that contributes to the interactivity of ISLM, and inclusion of videos, links, animations, and more in learning module to make it more interactive.



Interactive Self-Learning Module. It is a digital learning module like a simple online apps that offer a setting for learners to participate in the learning task and learn by viewing the animation or visual content (Jamwal, 2012). This is the product of this study. It takes the characteristics and nature of printed or conventional learning module but was enhanced by technology through inclusion of videos, hyperlinks, animation, and the nature of flipbook.

Learning Module. This tool helps students move through the subject and exams in the sequence that the teacher specifies by presenting the course material in a logical, sequential fashion. Structured text, files, weblinks, discussion topics, tasks, exams, quizzes, and evaluations are all included. It is possible to arrange the content's components in such a way that students must complete each one before going on to the next. (Alcantara, 2015). In this study, this is the basis idea of the developed product. Its potential maximizes through technological advancement.

Operations on Integers. Operations on integers refer to mathematical computations or manipulations involving positive and negative whole numbers. These operations include addition, subtraction, multiplication, and division of integers.

Validation. It refers to the assessment that a tool or material will undergo to determine if it is appropriate and complete in accordance with its intended use (Cohen, Manion & Morrison, 2000). In this study, this refers to the assessment of students and subject matter expert (internal validity), and testing the developed materials to the learner to determine if it can improve their performance in Operations on Integers



CHAPTER 2

METHODS

This chapter discusses the methods and procedures undertaken in improving the student's performance in Operations on Integers using flipbook through Agile Model. This includes research design, research locale, sampling and participants, instruments, procedure, data analysis and potential ethical issues.

Research Design

This study used developmental research as there was an inclusion of systematic study of designing, developing, and evaluating programs, processes, and products for instructional purposes that must satisfy the requirements of internal consistency and effectiveness as it is vital in instructional technology (Seels & Richey, 1994).

Developmental research can be the investigation of the effects and process of certain instructional design and development initiatives; a circumstance where someone is carrying out instructional design, development, or assessment tasks while concurrently researching the procedure; or the examination of the whole process of instructional design, development, and assessment or a specific process element.

According to Richey, Klein, & Nelson (2004), this research design can be divided into two types, type 1 and type 2. Type 1 focuses on a specific instructional instrument, program, method, or product. They demonstrate a desire to pinpoint either broad developmental concepts or situation-specific suggestions, while Type 2 concentrates on a specific design, development, or evaluation model or procedure. It might entail creating



and assessing original design models and procedures, and figuring out the circumstances that support their effective implementation.

Specifically, this study used Type 1 developmental research. This covered both product design and development and its evaluation. It validated a specific product, a Flipbook. Its data collection frequently involves the use of evaluation tools including learner surveys, achievement assessments, and performance measurements (Richey, Klein, & Nelson, 2004). An analysis phase, design phase, development phase, try-out and assessment phase are all possible in type 1 research (Richey & Klein, 2005) that is why this study followed a model that perfectly fit to this study, specifically Agile Model that has phases that corresponds to the prescribe phases of type 1 developmental research. The requirements analysis phase of Agile Model corresponds to the analysis phase, design phase to design phase, development phase to development phase, try-out and assessment phase to testing phase and deployment phase.

Research Locale

In this research study, the municipality of San Isidro served as the primary locale of investigation. Located in the southern part of Isabela, San Isidro is classified as a fifth-class municipality and is home to three schools catering to Junior High School students. The selection of San Isidro as the research locale is consider, driven by its diverse student population, making it a representative microcosm of the broader rural education landscape.

The municipality houses approximately 1,300 Junior High School students, with 283 grade 7 students from 10 different sections and from various socioeconomic



backgrounds. The need for catch-up material particularly in operations on integers is identified, as least mastered competencies are observed in this area, alongside other related competencies. This focus aligns with the educational requirements of the locale, contributing to the relevance and applicability of the research findings.

San Isidro provides a rich context for the study, encapsulating the challenges and opportunities encountered by educators in rural educational settings. The diverse student population, coupled with identified academic needs, enhances the research's potential to generate insights that can be generalized to similar contexts. Moreover, safety and protection of participants in San Isidro were ensured through strict adherence to ethical guidelines. This includes obtaining informed consent, maintaining confidentiality, securing data, addressing potential risks, and emphasizing voluntary participation. The research was conducted under ethical oversight, ensuring a secure and respectful environment for all participants. as the locale is conducive to ethical research practices and has been chosen with due consideration for the well-being of all involved parties.

Sampling and Participants

Participants in this study were Grade 7 students, Mathematics 7 teachers, and Experts.

The selection of Grade 7 students from San Isidro for the school year 2023-2024 was purposive, employing a specific purposive sampling technique known as total enumeration. All willing Grade 7 students from San Isidro were included as participants in this study and shown in the table below. Their input regarding the preferred theme for the



flipbook was integral to the design and development of the material, and they served as both student evaluators and end-users of the flipbook.

Table 1. Grade 7 respondents of the Study

Schools	Male	Female	Total	Percentage
School 1	83	107	190	75%
School 2	20	19	39	15%
School 3	13	12	25	10%
Total	116	138	254	100%

The study's respondents were drawn from three schools, with School 1 contributing the majority, totaling 190 participants (75% of the sample). In School 1, 83 were male, and 107 were female. School 2 had 39 respondents (15% of the sample), with a nearly equal distribution of 20 males and 19 females. School 3 comprised 25 respondents (10% of the sample), with 13 males and 12 females. Overall, the study involved 254 participants, with 116 males (45.7%) and 138 females (54.3%).

This demographic breakdown allows for a nuanced examination of theme preferences within the context of different schools, providing valuable insights into potential variations in preferences based on school-specific dynamics.

Next is Mathematics 7 teachers. They played a crucial role as they were responsible for administering the developed and validated Math Flipbook.

Additionally, three Subject Matter Experts (SME), selected purposively, were specialist in mathematics education. These experts validated the researcher-made questionnaires. Another set of three experts in mathematics, and instructional development



were purposively selected to validate the flipbook prototype, contributing valuable insights from their expertise.

Exclusion criteria was apply to students whose parents/legal guardians do not grant permission; individuals who express a desire not to participate; those who withdraw during the study, including students, teachers, and validators; and nuisance participant who disrupted the research process or undermines the quality of the study by providing inaccurate or unhelpful information, exhibiting uncooperative behavior, or causing interference in various ways. This careful selection and exclusion process ensures a focused and dedicated participant group for the study.

Instruments

This study utilized validated Survey/ Questionnaire (Checklist with open-ended question) to determine the students' preference in terms of flipbook's theme in learning operations on integers.

For the design and development of flipbook, online application/ ICT-based platforms, different Grade 7 learning resources and the result of students' theme preference were utilized.

In administering internal validation, validated Expert's Evaluation Rating Sheet adapted from DepEd Learning Resources Management and Development System (LRMDS) Assessment and Evaluation was utilized. LRMDS is used to find things that need to be bought, developed, or replicated to help divisions, regions, and schools in identifying the resources needed for learning, teaching, and professional development;



examining and suggesting resources for procurement; locating current resources for duplication or renovation; and assessing teacher-developed materials for usage locally and wide distribution. This system provides evaluation instruments that can be modified if necessary to better reflect the purpose of evaluation. Different materials were given different criteria to determine whether the material can be reproduced or implemented for mass consumption in basic education.

For external validation, a validated Student's Evaluation Rating Sheet, Pre-Test and Post Test were used.

It is also important to note that the validity of all the questionnaires were ensured through validation of three experts. Content Validity Index (CVI) of Polit and Beck (2006) using ratings of item relevance by content experts was utilized. Three experts rated the relevance of the items in the instrument using 4-point scale, 1 as Not Relevant, 2 as Somewhat Relevant, 3 as Quite Relevant, and 4 as Highly Relevant as suggested by Lynn (1986) and Davis (1992). S-CVI/Ave and S-CVI/UA computed values were both 1.00 in each theme, each factor and as a whole. This means that 100% of the items were judged content valid (Sauls, 2004) and the instrument has excellent content validity since it meets Lynn (1986) criteria, as suggested by Polit and Beck (2006), that for validation with 3 to 5 experts, each item in the instrument must have item-CVI of 1.00 otherwise it must be improved and must undergo another round of expert review.



Procedure

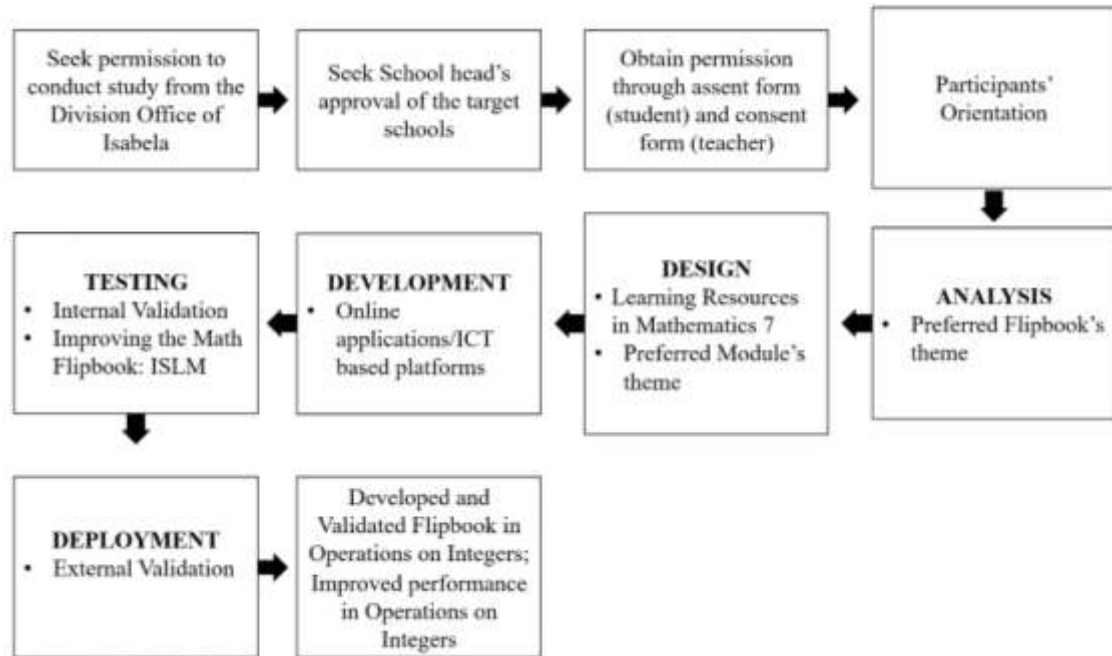


Figure 2. Procedural Flowchart of the Study

Figure 2 shows the procedural flowchart of the study. Before conducting the study, the researcher sought permission to conduct study first to the Schools Division Superintendent of Isabela and to the School Heads of the different schools. After the approval, the researcher obtained assent form from the intended participants, Grade 7 students, since all the students under this grade level are not on the legal age. Additionally, consent to participate in the study of the Mathematics 7 teacher was attained through consent form. Student and teacher participants were informed on the nature and their roles in the study through orientation.



After assuring the approvals or permission to conduct this study, and orienting the teacher and student respondents, the researcher followed the Agile Model, where the integral participation of the respondents started.

Starting from **Requirements Analysis** which involved students. Here, the researcher determined Grade 7 preferences in terms of the flipbook's theme using Survey/Questionnaire (Checklist with open-ended questions). They were given a maximum of 15 minutes to rate the different flipbook themes. Descriptive Statistics such as Mean and SD were used to analyze the instrument.

After that, the researcher designed the flipbook considering the different learning resources in Mathematics 7 and the data from the previous phase. This constitutes the **Design Phase**. Moreover, thematic analysis were conducted to ensure the alignment of the flipbook to the materials mentioned.

The Design Phase was immediately followed by the **Development Phase** or simply the actual development of the flipbook applying all the information in the previous two phases. This was made possible with the help of Online Application/ICT Based Platforms.

After the development, the researcher tested (**Test Phase**) the developed Math Flipbook through internal validation with the help of the three experts for possible improvements before deploying the material to the students. Descriptive Statistics such as mean and SD were used to analyze the adapted questionnaire from DepEd LRMDs Assessment and Evaluation. The validation of the flipbook prototype depends on the time needed by the subject matter experts considering their availability. The suggestions and



recommendations of the evaluators to further improve the flipbook were considered and applied. These were incorporated into any possible phase of the development process to maximize the potential of a developed Math Flipbook.

For the final phase, **Deployment Phase**, this involved teachers and students. This phase is the actual implementation of the evaluated flipbook from previous phase. Teachers and students were oriented on their roles through orientation session that only lasted for 10-15 minutes. The orientation includes, but not limited to, informing teachers on how to implement the flipbook, informing students how the flipbook can be accessed, and the basics on how to navigate the flipbook. Students may use the flipbook for one week, five days to a maximum of seven days. They were given a timetable which is only optional to follow because learners can answer the flipbook whenever possible within the given one-week period in order not to interrupt the regular classes.

The students used the Math Flipbook with their math teacher's supervision. Entry knowledge of the students was determined through the Pre-test and to determine if there is improvement, Post-Test was also administered. Both tests together with other activities were already in the flipbook and were created using google form. Paired Sample t-test/ Dependent Sample t-test were conducted to ascertain if there is a significant difference between the performance of students before and after using the Math Flipbook. Students also evaluated the flipbook using Student's Evaluation Rating Sheet that was analyzed using Descriptive Statistics such as mean and SD.



Debriefing session to math teachers and three random students was also conducted that last for 15-30 minutes, to provide participants with additional information about the study, address any questions or concerns they have, ask their experience, and ensure their well-being.

Ethical Considerations

Prior to the conduct of this study, permission to conduct a study letter was sent to the Schools Division Superintendent of Division of Isabela. Once approved, permission to the School Heads of different schools was asked before proceeding to the conduction. It was assured that learning competencies and content standards of the current curriculum were not sacrificed during the conduct of the study.

The respondents of this study were Grade 7 students at municipality of San Isidro during School Year 2023-2024. All the respondents are underage therefore, assent form from the students was obtained prior to the conduct of the study. On the other hand, consent of the Mathematics 7 teachers was attained through consent form. It was assured that this study did not affect their status as teachers. Also, participants were informed about the nature of the study.

In informing the participants about the nature of the study ensuring transparency and clarity throughout the research process, an information session was organized for all prospective participants prior to the initiation of data collection. This session provided an opportunity to explain the nature, objectives, and methodology of the study, empowering participants to make informed decisions about their involvement. They were also informed



of their respective role during the conduct of the study, and that they are not obliged to participate, and they can withdraw from the study anytime. It was explained to the participants that their participation in the research largely contributes to the development of catch-up material for Grade 7 learners.

The utmost care was taken to ensure that the data collection tools are free from biases, including those related to gender, class, ethnic, and cultural factors. The language used in all instruments was carefully chosen to avoid any offensive, discriminatory, or objectionable content.

The research treated the data with the utmost fairness to collect unbiased information. To maintain objectivity, there were no conflicts of interest. This ensured that the study's independence and integrity were not influenced by personal or financial gains for the researcher, their relatives, or friends. Additionally, to uphold objectivity, there was no connection between the participants and the researcher, such as the participants being students of the researcher. It's important to note that this study was not funded by any institution, further minimizing potential biases. Also, participants did not receive any remuneration, however, since the material developed was only available online, the researcher provided load allowance to those students who do not have internet access.

To ensure the protection of participants' privacy and confidentiality, measures were implemented throughout the data collection process. All collected data were anonymized, with participant identifiers replaced by unique codes to maintain confidentiality. Access to



the collected information was restricted to the researcher only, and any electronic data was securely stored on password-protected servers.

Participants' personal details were kept strictly confidential, and the researcher exercised the utmost discretion in handling sensitive information. Consent forms and any identifying information were stored separately from the research data to further safeguard participants' privacy.

Anonymity of the participants, acknowledgement of the work of others, proper citations of the resources used, and the use of data gathered solely for this study, were observed.

In this study, the researcher adhered to the informed consent process. The researcher personally solicit consent from participants, offered detailed information about the study's purpose, procedures, confidentiality measures, and the voluntary nature of participation through the information session. Prior to engaging in any study activities, the researcher obtained written consent from participants, allowing ample time for individuals to review the consent forms, seek clarification, and pose any questions they may have.

For special populations, especially minors, the researcher implemented an additional step in the form of securing written assent. The process of obtaining assent involved engaging minors in a conversation, during information session, about their willingness to participate, complemented by the guardian or parent's formal consent. Their safety and welfare throughout the research process is also in utmost priority.



This study acknowledges the unique impact on the academic community of students and teachers involved. While the focus is on enhancing educational practices, the study recognizes the potential implications for the community where it takes place. Sensitivity to cultural traditions and the academic environment were maintained to ensure that findings align with the principles of the educational institution. Some decisions about the study were made collaboratively with the participation of both students and teachers, fostering a sense of ownership and relevance.

Lastly, the results of this study were communicated to the participating schools. The researcher planned a multifaceted approach to disseminate findings, including presentation at conferences and publication in academic journals. These platforms serve as avenues for wider visibility and potential adoption of the study's implications, contributing to advancements in the teaching and learning process. Importantly, measures were in place to protect the confidentiality of participants' information during all stages of dissemination, upholding ethical standards and ensuring the responsible transfer of knowledge to the educational community. Additionally, efforts were made to engage with local educational forums, workshops, and community presentations, fostering a direct connection with the communities where the research was conducted and facilitating a meaningful exchange of knowledge and practices.



CHAPTER 3

RESULTS AND DISCUSSIONS

Requirement Analysis Phase

The requirement analysis of Agile Model is about collecting necessary information for the development of a certain project in which in this study the Math Flipbook, a catch-up material in Operations on Integers. Proficiency in integer operations is a fundamental prerequisite for success in advanced mathematical concepts like Algebra (Khalid & Embong, 2020, e.g., Herrera & Dio, 2016), and particularly relevant in national and international assessments such as NAT (Gonzales, 2019; DepEd Region 2, 2019), PISA (OECD, 2019; OECD 2023), TIMMS (Mullis, Martin, Foy, Kelly, & Fishbein, 2020). This led to the findings that catch-up material in this topic is needed as lack of mastery in operation on integers is a pressing school-based, national, and international concern.

To realize the development of Math Flipbook, under requirement analysis, the researcher determined the 254 Grade 7 students' preferences in terms of the flipbook's theme using Survey/ Questionnaire (Checklist with open-ended questions) shown below.

Table 2. Grade 7 students' preferences in terms of the flipbook's theme

Flipbook's Theme	Mean	SD	Description
Adventure	3.26	0.81	Very Interested
Animal	2.83	0.95	Interested
Anime/comics/cartoon	3.26	0.87	Very Interested
Art	2.73	0.92	Interested
Fantasy	2.66	0.96	Interested
Fashion	2.52	1.07	Interested
Food	3.03	1.00	Interested
Game Show	2.83	0.99	Interested
Horror	2.85	1.03	Interested
Movie	2.81	1.00	Interested
Music	3.11	1.04	Interested



Nature	2.80	1.00	Interested
Online Game	2.97	1.05	Interested
Pirates	2.41	0.92	Slightly Interested
Sports	3.01	1.10	Interested

This study aimed to identify the theme preference of Grade 7 learners for flipbook designed to enhance their performance in operations on integers. The data reveals that the most preferred are the Adventure and Anime/comics/cartoon themes, having the highest and the same mean score of 3.26 and a “Very Interested” description. On the other hand, the Pirates theme has the least interest, as indicated by the lowest mean score of 2.41 and a "Slightly Interested" description. Other themes like Animal, Art, Fantasy, Fashion, Food, Game Show, Horror, Movie, Music, Nature, Online Game, and Sports were generally met with interest.

The findings suggest that incorporating Adventure and Anime/comics/cartoon themes in the flipbook may make the flipbook in operations on integers more meaningful among Grade 7.

Adventure, as described in the Flipbook’s Theme Preference Survey used in gathering the data from the respondents, is the theme where the learner will encounter integer-based challenges, where the learner will use their understanding of operations on integers to solve problems and progress through the adventure, reinforcing their knowledge and skills. This is based on the definition of adventure as a genre, where the main character goes on a heroic journey with a mission, encountering numerous challenges along the way.



This genre is mostly paired with action genre, since long heroic journey has a lot of action, but it can be combined with almost any other genre as it is versatile. (Cater, 2013)

In this case, Anime/comics/cartoon is being combined with Adventure since respondents are also very interested in this theme. Here, Anime/comics/cartoon is a theme where learners will immerse themselves in anime/manga/cartoons-inspired scenarios and design while applying integer operations within the context of anime/manga storylines.

Anime and cartoons both involve hand-drawn images or comics that come to life through animation, specifically graphic design. Comics typically denote the medium of illustrated stories presented on physical pages, while cartoons and anime refer to illustrated stories presented on television. This kind of medium has also been used in the field of education for effective learning (Şentürk & Şimşek, 2021).

Design Phase

In this phase, the researcher designed the flipbook considering the different learning resources in Mathematics 7 and the data from the previous phase.

Flipbook Theme

From the Requirement Analysis, it has been found that respondents most preferred flipbook themes are Adventure and Anime/comics/cartoon. With this, the researcher combined the characteristics of these themes, discussed in previous phase, leading to the idea of using Detective Conan, a well-known adventure-anime, that started as comics, as a theme for the Math Flipbook.



Integrating Detective Conan as an adventure and anime/comics/cartoon theme for Math Flipbook is a creative and engaging choice, especially it aligns with the learning objectives and interests of the participants. Detective Conan involves problem-solving and deductive reasoning, which can be analogous to mathematical thinking. With this, flipbook may capture the attention of students and make the learning experience more enjoyable where the math content remains the focus, and the theme serves as a complementary element rather than overshadowing the educational goals of the flipbook (Cho, 2012).

The adventure of this anime is about a detective, Shinichi Kudo, a talented young detective prodigy, who inadvertently found himself shrunk into a child's body after being force-fed poison by members of a criminal syndicate, taking the name Conan Edogawa.

In an effort to safeguard himself and those he cares about, he takes up residence with his childhood friend Ran Mori and her father, Kogoro Mori. While living with them, Conan strategically employs Kogoro's detective agency to discreetly investigate the culprits behind his transformation. Throughout this covert mission, Conan faces the delicate task of preventing Ran from discovering his real identity.

For the storyline of the flipbook, the learner will help Conan to find his friends, Ran and Mori, the group of good Samaritan who helped him, and his friend's kidnapper. While joining the adventure of Conan, they will learn the operations on integers on their way to different police stations in Isabela. They will not only encounter real-life problems about integers, but they will also learn other things.



Additionally, this flipbook is designed considering the PSI. It is self-paced, that includes pre-recorded lessons, watching videos, multiple-choice questions. Although not compulsory, extra points are suggested for students who finish their tasks on time. Additional to PSI is the E-learning theory for the design principles to align with modern educational technology trends.

Flipbook Content

This is also the phase where the outline of the Math Flipbook is planned.

Kemp, Morrison, and Ross (1998) contend that the foundation for designing teaching modules involves four principal elements: students, objectives, methods, and assessment. Consequently, the initial step in responding to this challenge is to establish clear learning outcomes or objectives for the module. The designer must articulate these objectives in a precise manner to enable measurement, determining whether they have been achieved or not (Yusop, 2001). With learning outcomes in mind, researchers can devise approaches, tasks, and activities accordingly.

To ensure that the Math Flipbook content is consistent with topics/skills a grade 7 student is intending to learn the researcher made sure that the objectives can be found and aligned in the DepEd Learning Competencies written in Curriculum Guide. With that the researcher come up with objectives: Accurately apply the rules in performing the four fundamental operations on integers; solve real-life problems involving the four fundamental operations on integers.



The Math Flipbook also implicitly follows the parts of modules prescribe by DepEd as shown in the table below, since it also conforms to Shambaugh and Magliaro's (2006) module design consideration. These considerations are outlined as What is to be learned by the students? How do you identify a student who has learned it? c. How would you help the student learn? d. How do media and technology support student learning?

Table 3. DepEd module's parts correspond to the Math Flipbook parts

DepEd Module's Part	Description	Flipbook's Part
What I Need to Do	Provide learner with an idea of the skills or competencies that are expected to acquire	The Mission
What I Know	Assessment of learner's existing knowledge of the subject matter	The Great Math Challenge
What's In	Exercise or review designed to assist learner's in connecting the current lesson with their prior learning	Visualization and Application of Integers; Integer Operation Unleashed
What's New	Lesson introduction using various ways like songs, poems, problem, activity, or situation.	Introductory video; Visualization and Application of Integers; Integer Operation Unleashed
What is It	Brief discussion of the lesson	Integer Operation Unleashed
What's More	Lesson enhancement	Video Watching at San Isidro Police Station
What I Have Learned	Processing and summarizing what the learner learned in the lesson	Rule Summary
What I Can Do	Allows learners to apply acquired knowledge to real-life situations.	At the end of every discussion on fundamental operations on integers in Integer Operation Unleashed.



Assessment	Assessment of learner's level of mastery in achieving the learning competency	Ultimate Quest
Additional Activities	Activity to enhance the skills or improve the learning experience of the learner	Unfold My Story
References	List of all sources used in developing this module	References

This table illustrates the link between parts of a Department of Education (DepEd) module and corresponding sections in a Math Flipbook. The key components of the DepEd module are mapped to specific Math Flipbook parts, providing a clear alignment between the two educational resources. It is important to align the Math flipbooks parts to that of DepEd to ensure a seamless and coherent learning experience for students since it is also aligned with the prescribed lesson flow of DepEd which the respondents are situated. This alignment also contributes to a more effective learning environment for the students following the DepEd curriculum.

It is also important to note that the researcher deferred the sequence of some parts of the DepEd module to improve the storyline and satisfy the preferred flipbook themes of the respondents, without sacrificing the purpose of each part. The sequence of the flipbook is shown below with blue colored boxes as the Math Flipbooks part that corresponds to DepEd Module while green colored boxes are additional minor parts that gives life to the storyline of the material. Boxes with trapezoid above it signify the police stations that play



important role in the storyline, while yellow-colored boxes are subpart of the blue colored box above before them.

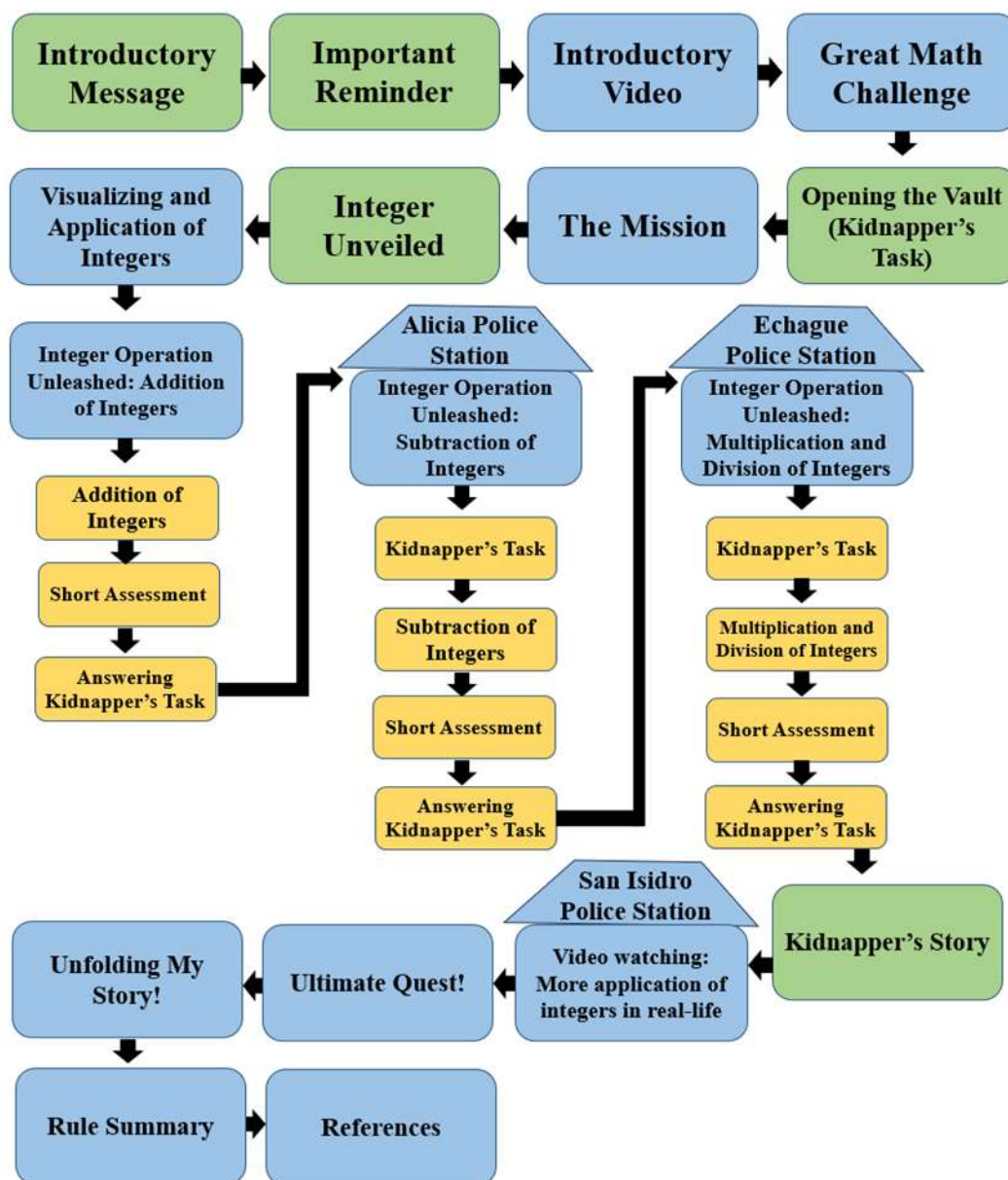


Figure 3. Flipbook's Parts Sequence



Flipbook Parts

Introductory Message. This introductory message provides users/learners essential information, set the tone, and create a positive first impression of the flipbook.

Important Reminder. This part reminds the user/learners the important parts of the flipbook that must be finished first before proceeding to the next page of the flipbook. These icons blink upon flipping, informing the user that a link is imbedded on them.

Introductory Video. This part is where the teacher introduces the mysterious friend and the vault from mysterious parcel that needs to be opened by getting the code from Great Math Challenge.

Great Math Challenge. The Great Math Challenge is the key to open the vault. This will serve as the pre-test, to determine the prior knowledge of the learners to the topic. After finishing the Great Math Challenge, the mysterious friend will be revealed through a video, and he is Conan.

Opening the Vault (Kidnapper's Task). This is the part where Conan talks to the learner asking for help to find his friends, Ran and Mori, and the group of good Samaritan who helped him. The learner will recall the code given after finishing the Great Math Challenge. The vault, when click will play a video where the vault contains a letter from kidnapper asking for big amount of money in exchange of Ran's freedom. The kidnapper gives choices, to provide the money or to answer his task. Conan is asking for help to do the task about operations on integers with the help of a teacher. This teacher is the one who will teach the Operations on Integers.



The Mission, Integer Unveiled. Here the teacher will be shown introducing the topic and the objectives. There is also another video about a short background of integers.

Visualizing and Application of Integers. Other videos are presented here about visualizing integers and some of its real-life applications and telling learners to continue the flipbook for more real-life applications.

Integer Operation Unleashed. This part is divided into three parts with subparts- Addition of Integers, Subtraction of Integers, Multiplication and Division of Integers.

Addition of Integers is being introduced by Boots and Dori, that are additional characters that will help the learner through the journey, reminding learners how they previously learned addition of integers. Rules in Addition of Integers is shown here, together with Boots and Dori explaining why using rules is better than other ways. Ways to apply the rules are shown/printed for those who just want to read. There are also videos for those who want to learn through a video. To test and monitor the progress of the learners, a short quiz about is prepared through google form that can be accessed in the flipping just by clicking an icon/button. Ending addition of integers, there is Answering the Kidnapper's through the video applying the learning in addition of integers. After answering the task, Ran will be set free but not Mori. The kidnapper will ask the learner to go to Alicia Police Station.

The journey continues with the exploration of Subtraction of Integers at Alicia Police Station. Clicking on the map reveals Isabela, highlighting Alicia with the municipality's real emergency hotline. A video guides learners to solve a task involving a



smartphone's passcode, linked to the coldest winter temperature. Integration of new information includes videos and photos on frostbite and hypothermia, accessible through corresponding icons in the flipbook. Rules for subtraction, again explained by Boots and Dori, stress the advantages of using rules. The section provides written instructions, videos, and a quiz through Google Form to monitor progress. "Answering the Kidnapper's Task" applies subtraction knowledge, securing Mori's release. Learners are then directed to Echague Police Station for information from a group of good Samaritans.

The final leg of the journey unfolds at Echague Police Station, introducing Multiplication and Division of Integers. Boots and Dori explain the dual learning approach, justified by the learner's task involving a businessman's profit or loss. Application methods are provided through written instructions and a video. Similar to previous sections, a quiz is available to monitor progress. Notably, a background change in the flipbook signifies a shift from night to day. "Answering the Kidnapper's Task" in the video employs the newly acquired multiplication and division skills. The outcome reveals that the kidnapper lost a certain amount of money in the problem.

Kidnapper's Story. Kidnapper's Story will be revealed in the video. The reasons why the kidnapper committed crime like kidnap for ransom will be exposed. Here, The kidnapper instructs the learner to go to San Isidro Police Station to find the group of good Samaritan who helped Conan.

San Isidro Police Station. Video watching more application of integers in real-life. Learners can learn more about real-life application of Integers in this part.



Ultimate Quest!. Ultimate Quest! can be accessed by clicking/tapping a certain button. This serves as the post-test intended to measure the learner's gained knowledge. At the end of this test, in congratulatory message, the group of the good Samaritan will be revealed. Before the adventure ends, Conan and his friends will give a message to the learner.

Unfolding My Story. Here, the kidnapper asks the learner to give his story an ending. This is just an optional activity for students. The learner can write the ending of the kidnapper's story and can be sent through the drive that can be accessed by clicking the click here button in the flipbook.

Rule Summary. Summary of the Rules in Operations is written here.

References. All the references used are written here following APA format-7th Edition.

Develop Phase

In this phase, the planned features of the flipbook were implemented.

First the researcher prepared the content of the flipbook based on its parts presented in previous phase. Videos were made by the researcher through offline application like PowerPoint, and Inshot, and online application, Videocartoonizer and Animaker. In most of the videos, there is this teacher explaining the operations on integers, to satisfy the anime/cartoon/comics theme of the flipbook, this teacher was cartoonized that made possible through videocartoonizer. PowerPoint was used to make the video background of the cartoonized video. Combining the cartoonized video and video background, and other effects, progress in Inshot.



Pictures needed in the flipbook were also prepared using PowerPoint.

Animaker was used to create the video for the Kidnapper's story. It is an online AI-driven animation generator and video creator designed to make high-quality video content accessible to everyone.

After making the video and preparing the pictures, the developer designs the flipbook using Canva. Canva is used to design the Math flipbook, getting its Detective Conan vibes, from its design background, additional pictures, and all written text needed in the flipbook. Spaces were left in flipbook for videos, icons insertion. After finalizing the design, it was downloaded as pdf. To give life to this pdf file, it was uploaded to an online application called Heyzine.

Heyzine serves as a tool that makes the Math Flipbook pdf from Canva simulate realistic page-turning effects, reflecting the anime/cartoon/comic and adventure vibes. With this platform the developed videos, prepared pictures, links, youtube videos were seamlessly incorporated in the Math Flipbook. This platform also gives the developer choices on how the image, video, content of embedded link would pop-up. There are also navigation control buttons like zoom, play, pause, and more available. All of this can be viewed in the flipbook user guide in appendix.

After uploading the Math Flipbook pdf to Heyzine and incorporating the images, videos, online videos, quizzes, and other simple designs, it was then published making it now available online. The platform gave many ways to access the published flipbook, such as through link or QR code.



Finally, the prototype appears as seen in the images below, and ready for validation by experts. The whole flipbook can be seen in Appendix.



Testing Phase

The testing phase is next after developing. The researcher tested the developed Math Flipbook against the requirements in terms of content quality, instructional quality, technical quality, and usability characteristics. This served as internal validation with the help of three experts.

Three experts in instructional material development, educational technology, mathematics, and research validated the developed Math Flipbook.



Expert 1 is a University Instructor, two years in service. She also has a master's degree under DOST scholarship with best thesis award about module development and is currently pursuing a Doctor of Philosophy in Mathematics Education.

Expert 2 is a Master Teacher 2 in one of the performing schools in SDO Isabela, a part time teacher in a known University in teacher education, and just about to have the title Doctor of Philosophy. He is an experienced teacher in the Department of Education, has been serving the teaching profession for 14 years, holding different recognitions and awards related to research.

Expert 3 is a professor, and OIC-Center for IPEDd in a known and performing University in teacher education, and a former DepEd teacher. He is also a Doctor of Philosophy with five years experience in the field. Like expert 2, he also received awards and recognition related to research.

The quality of the developed Math Flipbook is assessed in terms of alignment with the required learning competency, validated Expert's Evaluation Rating Sheet adapted from DepEd LRMDs Assessment and Evaluation for Non-print instructional materials, was utilized. Utilizing this rating sheet, the content quality, instructional quality, technical quality, and usability characteristics of the material are all evaluated.

To determine how effectively the materials satisfied the required indications the rating sheets employed a four-point Likert scale for satisfaction.

The evaluation of the three experts yields a percentage agreement of 86.9% for the inter-rater reliability, indicating a good reliability (Shrout & Fleis, 1979) of the developed



Math Flipbook. This result suggests that the experts have a reasonable level of agreement with the developed module. The foundation for understanding the validator's mean ratings may be found in the table below.

Table 4: Expert's evaluation on Math Flipbook in terms of five factors

Factors	Mean	SD	Description
Factor A. Content Quality			
1. Content is consistent with topics/skills found in the DepEd Learning Competencies for the subject and grade/year level it was intended.	4	0	Very Satisfactory
2. Concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives.	4	0	Very Satisfactory
3. Content is accurate	4	0	Very Satisfactory
4. Content is up-to-date	4	0	Very Satisfactory
5. Content is logically developed and organized.	4	0	Very Satisfactory
6. Content is free from cultural, gender, racial, or ethnic bias	4	0	Very Satisfactory
7. Content stimulates and promotes critical thinking.	4	0	Very Satisfactory
8. Content is relevant to real-life situations.	3.33	0	Very Satisfactory
9. Language (including vocabulary) is appropriate to the target user level.	4	0	Very Satisfactory
10. Content promotes positive values that support formative growth.	3.67	0.58	Very Satisfactory
Factor B. Instructional Quality			
1. Purpose of the material is well defined.	4	0	Very Satisfactory



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

2. Material achieves its defined purpose.	4	0	Very Satisfactory
3. Learning objectives are clearly stated and measurable.	4	0	Very Satisfactory
4. Level of difficulty is appropriate for the intended target user.	4	0	Very Satisfactory
5. Graphics / colors / sounds are used for appropriate instructional reasons.	4.	0	Very Satisfactory
6. Material is enjoyable, stimulating, challenging, and engaging.	4	0	Very Satisfactory
7. Material effectively stimulates creativity of target user.	4	0	Very Satisfactory
8. Feedback on target user's responses is effectively employed.	4	0	Very Satisfactory
9. Target user can control the rate and sequence of presentation and review.	4.	0	Very Satisfactory
10. Instruction is integrated with target user's previous experience.	4	0	Very Satisfactory

Factor C. Technical Quality

1. Audio/video enhances understanding of the concept.	4	0	Very Satisfactory
2. Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood.	4	0	Very Satisfactory
3. There is complete synchronization of audio with the visuals, if any.	4	0	Very Satisfactory
4. Music and sound effects are appropriate and effective for instructional purposes	4	0	Very Satisfactory



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

5. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing.	3	0	Very Satisfactory
6. Visual presentations (non-text) are clear and easy to interpret.	4	0	Very Satisfactory
7. Visuals sustain interest and do not distract user's attention.	4	0	Very Satisfactory
8. Visuals provide accurate representation of the concept discussed.	3.67	0.58	Very Satisfactory
9. The user support materials (if any) are effective	4	0	Very Satisfactory
10. The design allows the target user to navigate freely through the material.	4	0	Very Satisfactory
11. The material can easily and independently be used.	4	0	Very Satisfactory
12. The material will run using minimum system requirements.	3	0.58	Very Satisfactory
13. The program is free from technical problems.	3	0	Very Satisfactory
Factor D. Usability Characteristics			Very Satisfactory
D.1 Multimedia Design			
1. Media elements are of sufficiently high quality	3	0	Very Satisfactory
2. Clear and precise instructions are provided in accessing multimedia	4	0	Very Satisfactory
3. Appropriate forms of media are used to enhance presentation.	4	0	Very Satisfactory
4. The multimedia presentations have a coherent layout, design and background.	4	0	Very Satisfactory



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

- | | | | |
|---|---|---|-------------------|
| 5. Video is accompanied by a familiar control panel, featuring pause, volume, and slider (to move quickly to a desired part of the video) controls. | 4 | 0 | Very Satisfactory |
| 6. Audio (other than short sound effects) is accompanied by a familiar control panel, featuring pause, volume, and slider (to | 4 | 0 | Very Satisfactory |
| move quickly to a desired part of the audio) controls. | 4 | 0 | Very Satisfactory |
| 7. Images are accompanied by explanatory caption that the user can easily access. | 4 | 0 | Very Satisfactory |
| 8. All spoken sounds are accompanied by detailed textual transcription captions that the user can easily access. | 4 | 0 | Very Satisfactory |

D.2 Overall Interface

- | | | | |
|--|---|---|-------------------|
| 1. The design is visually appealing. | 4 | 0 | Very Satisfactory |
| 2. The design is simple, i.e. not cluttered, without irrelevant devices and information | 4 | 0 | Very Satisfactory |
| 3. The design is consistent throughout successive displays. | 4 | 0 | Very Satisfactory |
| 4. Contains sufficient information and directions for the user to use the resource. | 4 | 0 | Very Satisfactory |
| 5. The ways to navigate through the material are clear. | 4 | 0 | Very Satisfactory |
| 6. Labels, buttons, menus, text, and general layout of the resource are consistent and visually distinct | 4 | 0 | Very Satisfactory |



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

- | | | | |
|--|---|---|-------------------|
| 7. Fonts are readable in terms of size, color and contrast between the background and the text | 3 | 0 | Very Satisfactory |
| 8. The user is always made aware of what to do next. | 4 | 0 | Very Satisfactory |
| 9. The resource provides feedback about the user's responses | 4 | 0 | Very Satisfactory |

D.3 Behavior of Controls & System Information

- | | | | |
|--|------|------|-------------------|
| 1. The resource responds obviously and appropriately to learners' actions. | 3.67 | 0.58 | Very Satisfactory |
| 2. Icons that can be selected are designed to suggest their intended use. | 4 | 0 | Very Satisfactory |
| 3. Controls found in many parts of the resource (menus, buttons, and so on) that serve similar functions throughout the resource are placed in similar locations in displays. | 4 | 0 | Very Satisfactory |
| 4. Menus, buttons and other familiar controls use the same or similar formats and appearances throughout the resource. | 4 | 0 | Very Satisfactory |
| 5. A control that can be selected provides dynamic information to the user about the specific function (e.g. the mouse cursor changes appropriately and/or the control changes its visual appearance in some way). | 4 | 0 | Very Satisfactory |
| 6. A control that has been selected indicates to the user that the selected event has been recognized. | 4 | 0 | Very Satisfactory |

D.4 Customizability/ Support for User Preference

- | | | | |
|--|---|---|-------------------|
| 1. The user can adjust the magnification of displayed materials. | 4 | 0 | Very Satisfactory |
|--|---|---|-------------------|



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

- | | | | |
|--|---|---|-------------------|
| 2. Methods to support navigation are clear and consistent throughout the resource (e.g. arrows, menus, buttons). | 4 | 0 | Very Satisfactory |
| 3. The user can return to a previous state of the system and repeat from there. | 4 | 0 | Very Satisfactory |
| 4. All functionality is accessible through mouse or keyboard | 4 | 0 | Very Satisfactory |
| 5. The user can control the pace at which he/she moves through the material. | 4 | 0 | Very Satisfactory |

D.5 Hyperlinks

- | | | | |
|--|---|---|--|
| 1. Hyperlink provides information about where the link will lead. | 4 | 0 | Very Satisfactory
Very Satisfactory |
| 2. Hyperlinks text (if there is any) are formatted using acceptable formatting conventions for links (e.g. distinctive underlined font). | 4 | 0 | Very Satisfactory |
| 3. Hyperlink text (if there is any) is consistently formatted throughout the resource. | 4 | 0 | Very Satisfactory |
| 4. The cursor or hyperlink changes appearance to inform the user of the presence of a hyperlink. | 4 | 0 | Very Satisfactory |
| 5. Hyperlinks that result in the user being directed to material that is external to the current resource are clearly indicated. | 4 | 0 | Very Satisfactory |

Overall	3.92	0.27
---------	------	------

Legend: 1-1.75 Not Satisfactory, 1.76-2.5 Poor, 2.51-3.25 Satisfactory, 3.26-4 Very Satisfactory

The table shows an overall mean of 3.92 and an overall standard deviation of 0.27, indicating that the experts are very satisfied with the fulfillment of all the factors for the



Math Flipbook. This result infers that the flipbook is clearly outstanding in the factors – content quality, instructional quality, technical quality, and usability characteristics.

Factor A: Content Quality

The content quality is rated as very satisfactory, with the 10 items indicating that the Math Flipbook is a high-quality educational material that emphasizes alignment with DepEd Learning Competencies, fosters enrichment of learning objectives, maintains accuracy and currency, logically organized, not bias, encourages critical thinking, relevant to real-life, uses suitable language, and promotes positive values for formative growth.

Factor B: Instructional Quality

For instructional quality, the Math Flipbook garnered a very satisfactory rating from the experts. This means that the instructional quality of the Math Flipbook is evident through its well-defined purpose and successful achievement of objectives. Clear and measurable learning objectives are presented, with an appropriate level of difficulty designed to the target user. The incorporation of graphics, colors, and sounds is purposeful, enhancing the overall instructional experience. The material is designed to be enjoyable, stimulating, challenging, and engaging, effectively stimulating the creativity of the target user. Feedback mechanisms on user responses contribute to the effectiveness of the instructional process. Users have control over the pace and sequence of presentation and review, fostering a personalized learning experience. Additionally, the instruction is thoughtfully integrated with the user's previous experiences, creating a cohesive and comprehensive educational journey.



Factor C: Technical Quality

Another very satisfactory rating was earned in terms of the technical quality of the Math Flipbook. This implies that Math Flipbook is characterized by its seamless integration of audio and video elements to enhance concept understanding. Speech and narration display clear pacing, intonation, and pronunciation, ensuring easy comprehension. Complete synchronization of audio with visuals is maintained, and music and sound effects are appropriately used for instructional purposes. Screen displays are uncluttered and aesthetically pleasing, promoting readability. Visual presentations are clear and easily interpreted, sustaining interest without distracting the user. The visuals accurately represent the discussed concepts. User support materials are effective, allowing for independent and easy navigation through the material. The design ensures compatibility with minimum system requirements, and the material is free from technical problems, ensuring a smooth and user-friendly experience.

Factor D: Usability Characteristics

The last factor is the usability characteristics which is composed of 5 subfactors- Multimedia Design, Overall Interface, Behavior of Controls & System Information, Customizability/ Support for User Preference, and Hyperlinks. This factor is also deemed to be very satisfactory in each subfactors.

Multimedia Design (D.1)

In multimedia design, the very satisfactory rating of the Math Flipbook shows that a focus on quality is maintained with high-quality media elements. Its clear and precise



instructions guide users in accessing multimedia content, while appropriate forms of media enhance the overall presentation. The multimedia presentations exhibit a coherent layout, design, and background, contributing to a seamless user experience. Video and audio elements used include familiar control panels featuring essential functions like pause, volume control, and slider for quick navigation. Images are complemented by easily accessible explanatory captions, and spoken sounds are accompanied by detailed textual transcriptions, ensuring comprehensive access, and understanding for users.

Overall Interface (D.2)

Moreover, overall interface rating means that the overall interface of the Math Flipbook is thoughtfully designed to provide an appealing and user-friendly experience. The simplicity of the design, devoid of clutter and irrelevant elements, enhances user engagement. Consistency is maintained throughout successive displays, ensuring a seamless and cohesive interface. The flipbook contains sufficient information and clear directions for users, facilitating effective utilization. Navigation options are evident and straightforward, with consistent labels, buttons, menus, and layout, enhancing visual distinctiveness. Readability is prioritized, with fonts ensuring clarity in terms of size, color, and contrast. Users are consistently guided on the next steps, and the flipbook offers feedback on user responses, contributing to an intuitive and responsive interface.

Behavior of Controls and System Information (D.3)

The third subfactor is the behavior of controls and system information. It also has a very satisfactory rating; this implies that the behavior of controls and system information



in the flipbook is user responsive. Icons are thoughtfully designed, suggesting their intended use, and facilitating easy identification for users. Controls, present in various parts of the resource, consistently serve similar functions and are strategically placed for user convenience. Familiar controls like menus and buttons maintain a uniform format and appearance throughout, contributing to a cohesive user interface. When a control is selected, it dynamically provides information through changes in the cursor or visual appearance, ensuring users are informed about specific functions. The resource effectively communicates the recognition of a selected event, fostering a clear and well-connected user experience.

Customizability/ Support for User Preference (D.4)

Reflected by another very satisfactory rating, the Math flipbook prioritizes customizability and support for user preferences with several key features. Users have the flexibility to adjust the magnification of displayed materials, ensuring personalized viewing experiences. Navigation is facilitated through clear and consistent methods, including arrows, menus, and buttons, enhancing user understanding and control. Users can easily return to the previous state of the system, allowing for seamless navigation and the ability to repeat specific sections. Accessibility is emphasized, with all functionalities accessible through both mouse and keyboard inputs, catering to diverse user preferences. Additionally, users have control over the pace at which they move through the material, promoting a tailored and user-friendly interaction.



Hyperlinks (D.5)

Lastly, hyperlinks in the Math Flipbook are designed with user clarity and consistency in mind. Each hyperlink provides information about its destination, enabling users to make informed choices. The text of hyperlinks follows acceptable formatting conventions, utilizing distinctive underlined fonts for clear identification. Consistency is maintained in the formatting of hyperlink text throughout the resource, contributing to a cohesive visual experience. To further enhance user awareness, the cursor or hyperlink visibly changes its appearance, providing a clear indication of interactive elements. Hyperlinks leading to external material are explicitly marked, ensuring users are aware when they are directed outside the current resource. These considerations collectively contribute to an effective and user-friendly hyperlink experience.

In conclusion, the comprehensive evaluation of the Math Flipbook reveals an exceptionally high level of satisfaction among experts, as evidenced by a mean overall rating of 3.92 and a standard deviation of 0.27. This indicates that the experts are very pleased with the fulfillment of all factors, encompassing content quality, instructional quality, technical quality, and usability characteristics. The content quality, instructional quality, and technical quality received very satisfactory ratings, showcasing the Flipbook's outstanding alignment with educational competencies, clear instructional design, and seamless technical integration. The usability characteristics, encompassing multimedia design, overall interface, behavior of controls & system information, customizability/support for user preference, and hyperlinks, also earned a very satisfactory



rating. This denotes a well-thought-out interface design, user-responsive controls, and a high degree of customizability and support for user preferences. Altogether, these results affirm the Math Flipbook's excellence in providing an enriching, engaging, and user-friendly educational experience across various dimensions.

Overall, very satisfactory rating indicates a high level of satisfaction among experts with the Math Flipbook. Expert 1 highly praises the material for its innovation, inspiring qualities for classroom adoption, and its ability to address students' needs in the presented topic. Expert 2 said that the flipbook would help and enrich the learning of learners and is hoping to see or encounter similar materials that the researcher developed as mathematics teacher. Expert 3 echoes positive sentiments, noting the material's ease of use, suitability for the intended audience, and suggesting improvements in visuals while emphasizing the importance of consistency in presenting ideas.

With its very satisfactory rating, suggestions of the experts were still satisfied before going to the next phase like enhancing some visuals, enhancing size of the text to become more readable, and enhancing video quality. However, other optional suggestions like “Add audio when the learners click the icons if possible” was not satisfied due technology’s limitation. After finalizing and make minimal changes the Math Flipbook is ready for deployment.



Deployment Phase

Deployment Phase, this is the point where the product is being delivered to the end-users that served as the external validation. The goal of this phase is to get feedback from its end user since their satisfaction is being prioritized.

In this phase teachers and students were oriented on their respective roles through orientation sessions lasting for approximately 10-15 minutes. The orientation covered various aspects, including instructing teachers on how to implement the flipbook, informing students on accessing the flipbook, and providing basics on navigating it. Students were allowed to use the flipbook for one week, with a timeframe of five to a maximum of seven days. They were provided with an optional timetable, as learners could answer the flipbook at their convenience within the given one-week period to avoid disrupting regular classes. The Math Flipbook was used by students under the supervision of their math teacher. The pre-test and post-test were administered and was embedded in the Math Flipbook. After that, the students rated the material using a questionnaire in terms of the five factors. Comparing pre-test and post-test, and the result of students rating are shown in the succeeding table.

Table 5. *t*-test results comparing test scores of grade 7 students before and after using Math Flipbook

	Mean	Mean	Std.	Std.	95% Confidence		t	df	Sig. (2-
		Difference	Deviation	Error	Interval				tailed)
				Mean	Lower	Upper			
Pre	8.14	-7.719	.320	.316	-8.349	-7.090	-24.151	253	.000
Post	15.86								



The table shows t-test results comparing the test scores of grade 7 students before and after using Math Flipbook. The negative mean difference of -7.719 suggests that, on average, students scored lower on the pre-test compared to the post-test. This difference between the mean scores is statistically significant supported through the rejection of null hypothesis ($t=-24.151$; $p< 0.05$).

The negative mean difference and the statistical significance of the t-test suggest that the Math Flipbook intervention has led to a significant improvement in the test scores of grade 7 students. The findings imply that, on average, students performed better after using the Math Flipbook. This positive outcome underscores the effectiveness of this catch-up material in improving the students' performance in integer operations. It is also important to note that using DepEd student mastery level as described in Department of Education (DepEd) Order No.160, (2012, pg. 1), the pre-test mean score of 8.14 with 33.92% mean percentage score implies that students' mastery level is under low mastery before the using the Math Flipbook. This also supports the initial claim that there is really a need for improvement in this area. However, significant improvement is shown by post-test mean score of 15.86 with 66.08% mean percentage score indicates that students' mastery level is under moving towards mastery.

This result is supported and conform the study of Rondillas & Buan's (2019) stipulating that using ISLM with integration of videos, interactive websites, and online assessments proved instrumental in enhancing student achievement. This is also true with Kaplar, Radovic, Veljkovic, Simic-Muller, and Maric (2021) claiming that ISLMs



positively influenced students' problem-solving abilities requiring various forms of mathematical reasoning and that inclusion of multimedia elements and subject matter integration, such as video, animation, text, images, and e-content contributed to increased student success in mathematics and helped in improving mathematical understanding and skills that educators and policymakers may consider further exploring and implementing similar instructional tools to improve overall learning outcome.

Table 6: Student's evaluation on Math Flipbook in terms of five factors

Factors	Mean	SD	Description
Factor A. Content Quality			
1. The things I learn from this Math flipbook match what I'm supposed to learn in my Math 7, according to the DepEd Learning Competencies.	3.97	0.16	Very Satisfactory
2. The ideas and lessons in this Math flipbook helped me get better at operations with integers and make me feel more confident about what I have learned.	3.99	0.11	Very Satisfactory
3. I think the information in this Math flipbook is correct and right.	3.99	0.09	Very Satisfactory
4. I feel like the content in this Math flipbook is new and includes the latest information.	3.98	0.19	Very Satisfactory
5. The way the content is organized in this Math flipbook makes sense and is easy for me to understand.	3.98	0.12	Very Satisfactory
6. Content of this Math flipbook treats everyone equally, no matter their culture, gender, race, or where they come from.	3.99	0.11	Very Satisfactory
7. The content in this Math flipbook makes me think and helps me solve problems in a clever way.	3.98	0.12	Very Satisfactory



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

- | | | | |
|--|------|------|-------------------|
| 8. The content in this Math flipbook shows me how math is useful in real-life situations that I can relate to. | 3.99 | 0.11 | Very Satisfactory |
| 9. The words and language used in this Math flipbook are just right for someone my age and make it easy for me to learn. | 3.99 | 0.11 | Very Satisfactory |
| 10. The content in this Math flipbook teaches me good values and helps me grow as a person. | 3.94 | 0.27 | Very Satisfactory |

Factor B. Instructional Quality

- | | | | |
|---|------|------|-------------------|
| 1. The purpose of this material is clear and easy for me to understand. | 3.98 | 0.15 | Very Satisfactory |
| 2. Math Flipbook does a good job of achieving its intended purpose. | 3.98 | 0.14 | Very Satisfactory |
| 3. The things I am supposed to learn from Math Flipbook are explained clearly, and I can tell if I have learned them or not. | 3.99 | 0.14 | Very Satisfactory |
| 4. The difficulty level of Math Flipbook is just right for someone like me who is using it. | 3.97 | 0.22 | Very Satisfactory |
| 5. The pictures, colors, and sounds in this Math Flipbook help me understand and learn better. | 3.98 | 0.14 | Very Satisfactory |
| 6. I enjoy using this Math Flipbook because it is interesting, fun, and makes me think. | 3.99 | 0.11 | Very Satisfactory |
| 7. Math Flipbook helps me be creative and come up with new ideas. | 3.95 | 0.25 | Very Satisfactory |
| 8. When I answer questions or do activities, I get feedback that helps me understand if I did it right or if I need to try again. | 3.99 | 0.11 | Very Satisfactory |
| 9. I can control how fast I go through Math Flipbook and review it as needed. | 3.98 | 0.15 | Very Satisfactory |
| 10. This material connects with things I already know and helps me learn new things based on what I already experienced. | 3.99 | 0.09 | Very Satisfactory |

**Factor C. Technical Quality**

1. Audio/video enhances understanding of the concept.	3.97	0.17	Very Satisfactory
2. Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood.	3.98	0.14	Very Satisfactory
3. There is complete synchronization of audio with the visuals.	3.99	0.11	Very Satisfactory
4. Music and sound effects are appropriate and effective for instructional purposes	3.97	0.16	Very Satisfactory
5. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing.	3.98	0.14	Very Satisfactory
6. Visual presentations (non-text) are clear and easy to interpret.	3.98	0.14	Very Satisfactory
7. Math Flipbook's Visuals sustains my interest.	3.99	0.11	Very Satisfactory
8. Visuals provide accurate representation of the concept discussed.	3.95	0.25	Very Satisfactory
9. The user support materials (if any) are effective.	3.96	0.22	Very Satisfactory
10. The design allows the target user to navigate freely through the Math Flipbook.	3.99	0.11	Very Satisfactory
11. The Math Flipbook can easily and independently be used.	3.95	0.21	Very Satisfactory
12. Math Flipbook is free from technical problems.	3.71	0.50	Very Satisfactory

Factor D. Usability Characteristics**D.1 Multimedia Design**

1. The pictures, videos, and other things I see in this Math flipbook look really good and clear.	3.95	0.28	Very Satisfactory
2. I can easily understand the instructions that tell me how to use the different parts of this Math flipbook with pictures and videos.	3.98	0.14	Very Satisfactory
3. This Math flipbook uses things like pictures and videos in a good way to make learning more fun and interesting.	3.99	0.11	Very Satisfactory
4. The way this Math flipbook looks, with its layout, design, and background, all make sense and help me understand what I'm learning.	4.00	0.06	Very Satisfactory



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

5. When there is a video in this Math flipbook, I can use buttons that I recognize to pause it, change the volume, and move to different parts of the video.	3.96	0.19	Very Satisfactory
6. If there is sound or music in this Math flipbook, I can use buttons that I know to pause it, change the volume, and move to different parts of the sound or music.	3.98	0.15	Very Satisfactory
7. Every picture in this Math flipbook has words that explain what's happening, and I can easily read them to understand better.	3.96	0.19	Very Satisfactory
8. When there are sounds or voices in this Math flipbook, there are words on the screen that show me exactly what is being said, and I can easily read them.	3.99	0.11	Very Satisfactory

D.2 Overall Interface

1. The design of this Math flipbook looks really nice and attractive.	3.99	0.11	Very Satisfactory
2. The design of this Math flipbook is simple and not crowded, with only the important things and no unnecessary information.	3.96	0.22	Very Satisfactory
3. The design of this Math flipbook has a theme that looks consistent as I go through different parts of it.	3.98	0.14	Very Satisfactory
4. This Math flipbook has enough information and instructions for me to understand how to use it.	3.95	0.29	Very Satisfactory
5. It's easy for me to find my way around and move through this Math flipbook.	3.99	0.11	Very Satisfactory
6. The buttons, menus, text, and overall layout of this Math flipbook are always the same and look different from each other, so I can easily recognize them.	3.99	0.09	Very Satisfactory
7. The words in this Math flipbook are easy to read because the font size, color, and the contrast with the background are just right.	3.99	0.11	Very Satisfactory
8. I always know what I need to do next because this Math flipbook tells me.	3.98	0.15	Very Satisfactory



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

- | | | | |
|---|------|------|-------------------|
| 9. This Math flipbook gives me feedback to let me know if I did things right or if I need to try again. | 3.97 | 0.17 | Very Satisfactory |
|---|------|------|-------------------|

D.3 Behavior of Controls & System Information

- | | | | |
|---|------|------|-------------------|
| 1. This Math flipbook does what I expect it to do when I interact with it using the buttons available. | 3.95 | 0.21 | Very Satisfactory |
| 2. The pictures or symbols I can choose in this Math flipbook show me what they are for and make it easy to understand. | 4.00 | 0.06 | Very Satisfactory |
| 3. The buttons, menus, and other things I can click on in different parts of this Math flipbook are always in the same places, so I can find them easily. | 3.99 | 0.09 | Very Satisfactory |
| 4. The buttons, menus, and other things I can click on in this Math flipbook look the same or similar. | 3.98 | 0.12 | Very Satisfactory |
| 5. When I can select a button or control in this Math flipbook, it gives me information about what it does by changing the way it looks or by showing me something new. | 3.98 | 0.12 | Very Satisfactory |
| 6. When I click on interactive icon, I can see that it knows I clicked on it because it changes or shows something different. | 3.99 | 0.09 | Very Satisfactory |

D.4 Customizability/ Support for User Preference

- | | | | |
|---|------|------|-------------------|
| 1. I can make the things I see in this Math flipbook bigger or smaller to see them better. | 3.99 | 0.09 | Very Satisfactory |
| 2. I can move around and find things easily in this Math flipbook because there are clear and consistent ways to navigate, like using arrows, keyboard shortcuts, or menus. | 3.99 | 0.11 | Very Satisfactory |
| 3. If I want to go back to something I did before in this Math flipbook, I can do that and start from there again. | 3.98 | 0.14 | Very Satisfactory |
| 4. I can do everything in this Math flipbook using either the mouse or the keyboard. | 3.96 | 0.20 | Very Satisfactory |
| 5. I can choose how fast or slow I want to go through the Math flipbook. | 3.98 | 0.12 | Very Satisfactory |



D.5 Hyperlinks

1. The pictures/icon that are clickable and take me to another place have information that tells me where they will take me.	3.98	0.12	Very Satisfactory
2. The clickable words (if there's any) are underlined and look different from the other text, which helps me know that they are links.	3.99	0.11	Very Satisfactory
3. The words/pictures that are links look the same all the time in all parts of this Math flipbook.	3.97	0.21	Very Satisfactory
4. When I move my mouse over a link or click on it, the mouse cursor or the appearance of the words/picture change to show me that it's a link.	3.98	0.14	Very Satisfactory
5. If a link takes me to something outside of this Math flipbook, it is clearly shown or indicated to me.	3.98	0.12	Very Satisfactory
Overall	3.97	0.17	Very Satisfactory

Legend: 1-1.75 Not Satisfactory, 1.76-2.5 Poor, 2.51-3.25 Satisfactory, 3.26-4 Very Satisfactory

The evaluation table reflects highly positive feedback from Grade 7 students regarding the Math Flipbook across various factors. All items within each factor were consistently rated as “Very Satisfactory” with overall mean of 3.97 and a standard deviation of 0.17. Just like in the experts evaluation, the flipbook is clearly outstanding for the students in the factors – content quality, instructional quality, technical quality, and usability characteristics.

Factor A: Content Quality

Students expressed satisfaction with the alignment of the flipbook content with the DepEd Learning Competencies. The content was perceived as beneficial for improving skills in operations with integers, instilling confidence, and providing new and updated



information. The organized structure of the content was commended for its clarity and ease of understanding. Additionally, the inclusive nature of the content, promoting equality among students, was highlighted.

Students not only affirmed the alignment of the flipbook content with DepEd Learning Competencies but also highlighted specific instances where the material helped them gain a better understanding of mathematical concepts as Student 1 articulated,

“Narere-fresh po sa akin yung lesson at nacocorrect po yung maling alam ko pati po yung pagkalito ko sa mga rules”

Several students mentioned that the inclusion of real-life examples and applications made the content more relatable and interesting. This is confirmed by Student 2 and Student 3,

“Napag-aralan na po namin, ‘yong operations on integers pero maganda po ‘yong flipbook kase may napapanuod po na nagpapakita kung saan nagagamit ‘yong integers”

“Nakakaenjoy po gamitin kasi mas mas nakikita na po naming kung saan ginagamit yung math. Dati po kasi ang alam ko lang ‘pag negative, utang, pwede rin pala sa temperature”

On Math teachers’ side, teachers noted that the content delivery through the flipbook was effective in engaging students. They observed increased participation and a positive response to the interactive elements. One teacher remarked,

“Ang daming naexcite, syempre tinatanong-tanong ko rin sila, maganda kasi may mga videos, may effects raw tapos unique”



Factor B: Instructional Quality

Students found the purpose of the material clear and appreciated its effectiveness in achieving its intended goals. Clear explanations, appropriate difficulty levels, and engaging elements such as pictures, colors, and sounds contributed to a positive learning experience. The flipbook was perceived as not only informative but also enjoyable, fostering creativity and the generation of new ideas. Feedback mechanisms were acknowledged for aiding understanding and providing control over the learning pace.

Enthusiasm with the students was visible for the engaging elements such as colorful visuals and interactive features. They noted that the flipbook managed to strike a balance between being informative and enjoyable as emphasized in the statement of Student 2,

“Maganda rin po yung design, hindi katulad ng mga module na binibigay. Dito po naexcite ako tignan yung next page tapos yung mangyayari sa story habang natututo ako”

“Ang dami pong additional information na ngayon ko lang narealize na connected pala sa pinag-aaralan naming.”

Some students commented on the encouragement they felt when receiving feedback, stating that it motivated them to continue with the assessments. Student 1 shared while Student 2 added, respectively,

“Nakakatuwa rin po na alam ko na agad ‘yong score ko sa mga sinasagutan, alam na po saan na ‘yong natutunan mo”

“Kapag mababa po yung score ko mas ginagalingan ko pa po sa next quiz kasi instant po na nalalaman na yung score eh”



Factor C: Technical Quality

Students appreciated the technical aspects of the flipbook, including the enhancement of understanding through audio/video elements, clear speech and narration, and complete synchronization of audio with visuals. The visual appeal, and minimal technical problems contributed to a seamless user experience. The design allowed for independent navigation, and user support materials were deemed effective.

For technical aspects, students praised the flipbook, particularly its incorporation of audio and video elements, clear speech, and seamless synchronization of audio with visuals. They found subtitles especially helpful in aiding comprehension, as expressed by Student 3,

“Nagustuhan ko po sa video ay may subtitle, para mas madaling maintindihan”

However, some students faced challenges accessing assessments due to a lack of email accounts or internet connectivity.

“Isa po sa problem ko noong una ay wala po akong email”-Student 3

“...wala po akong internet kaya nakikiinternet po ako”- Student 2

“May time rin po noong una na hindi ko po mabuksan yung link, loading lang po”- Student 1

These are also the concerns of subject teachers, emphasizing difficulties students faced without email accounts or encountering delays in accessing links.

“Marami pang wala email kasi, kaya noong una nahihirapan sila at panay ang chat sa GC”- Teacher 1

“Matagal mabuksan yung link noong una, sa dami siguro nang nag-aaccess”-Teacher 2



Though there are minimal technical issues encountered by the students, these were immediately addressed and were appreciated, with students having a smooth learning process.

To address the problem in email, the researcher created an email to be used by those students having email-related problems, like those who do not have or just forgot their email password. In the internet problem some learners claimed that they used free WiFi of their barangays and for students lacking internet access, the researcher provided support. Furthermore, scheduling specific days and hours for each section helped manage website traffic effectively, ensuring smoother access for all users.

Factor D: Usability Characteristics

Multimedia Design (D.1)

The visual elements, including pictures and videos, were praised for their clarity and attractiveness. Students found the instructions easy to follow, and the multimedia elements enhanced the learning experience. Student 1 remarked,

“Madali lang pong gamitin kasi po naiintindihan po ‘yong sunod-sunod.”

Student 2 noted,

”Sa una pa lang po may reminders na, ‘yong iba ko pong classmate nagbabagtas kaya po nalilito sila, pero noong sinabi ko po na panuorin mga videos at ‘wag mag-jump nasundan na po nila.”

Similarly, Student 3 shared,



“Naglagpas-lagpas po ako noong una, kaya nalito ako saan yung mga sasagutan, ‘yon pala po connected po ‘yong laman nya”

Teachers also expressed satisfaction with the ease of administering the Math Flipbook. Moreover, they highlighted the importance of constant reminder to the students.

Teacher 3 said,

“Mas okay kaysa magre-teach ako. Sa dami ba naman ng gawain natin, but there should be a constant guidance for the students, kasi may time na nalilito sila kasi first time, iguide rin yung mga hindi masyadong techie”

Overall Interface (D.2)

The design of the flipbook was considered visually appealing, consistent, and user-friendly. Students commended the clarity of information, ease of navigation, and consistent appearance of buttons and menus.

Students find the flipbook aesthetically pleasing and well-organized. The thematic consistency in design was recognized for creating a cohesive and immersive learning environment. Qualitative feedback also highlighted the perceived simplicity of the design, making it easy for students to focus on the content. As Student 3 noted,

“Sakto lang po ‘yong design n’ya hindi po s’ya OA, nagbeblend po ‘yong topic tapos ‘yong Conan.”

Similarly, Student 1 said,



“Bagay po ‘yong design kasi nakukuha n’ya po ‘yong Detective Conan vibes”

Behavior of Controls & System Information (D.3)

The flipbook met expectations in terms of control behavior, with easily recognizable symbols and consistent placement of buttons. Interactive elements responded appropriately to user actions.

Students noted the intuitive nature of controls, stating that buttons and interactive elements behaved predictably. They appreciated the consistency in the placement of controls, which contributed to a seamless and efficient navigation experience as student 3 specifically mentioned,

“Gusto ko po ‘yong pagnagblink ‘yong picture pagkinlick may lalabas na picture o may video o quiz”

Customizability/ Support for User Preference (D.4)

The flipbook allowed users to customize their experience, adjusting the size of elements and choosing navigation methods. Flexibility in navigation and the ability to return to previous sections were appreciated.

Students mentioned the value of customization options, emphasizing the importance of being able to adapt the learning environment to suit their preferences. The ability to control the pace of learning and review sections as needed was highlighted as a positive aspect. For example, Student 3 mentioned when talking about the ability of the flipbook to adjust its elements’ size,



“...isa rin po ‘yon sa nagustuhan ko, pwede pong izoom”

Additionally, Student 2 compared the functionality of the videos to YouTube, stating,

‘Yong videos po parang nanunuod lang sa youtube...pwede po kasing iforward, ihinto, iplay”

Hyperlinks (D.5)

Students found the clickable elements, including pictures and words, to be clearly indicated and consistent throughout the flipbook. The behavior of links, including cursor changes, was recognized as intuitive. Statement from Student 3 could prove this claim because all hyperlinks in the flipbook blink upon turning the page informing the user that those are clickable elements.

“Gusto ko po ‘yong pagnagblink ‘yong picture pagkinlick may lalabas na picture o may video o quiz”

In conclusion, the Grade 7 students overwhelmingly expressed satisfaction with the Math Flipbook, praising its content, instructional quality, technical aspects, and usability characteristics. The positive feedback suggests that the flipbook effectively supports their learning needs, making it a valuable resource and an effective catch-up material in the educational context.



CHAPTER 4

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary of the Study

To address underachievement in mathematics, particularly in fundamental concepts like Operations on Integers that poses a pressing concern and hindering progress in advanced mathematical topics, this study developed Math Flipbook using the Agile Model, aiming to improve students' performance in Operations on Integers. This is also aligned with the "I-Increase" component of the RAPID framework and the Basic Education Development Plan (BEDP) 2030, emphasizing the need to implement catch-up strategies with measurable positive impacts on student learning and promoting and motivating self-guided learning.

Following the model, development and evaluation of Math Flipbook encompassed various phases including Requirement Analysis, Design, Development, Testing, and Deployment. The developed Math Flipbook incorporates interactive learning, animations, and videos to enhance the educational process. Throughout these stages, the flipbook was crafted to align with Grade 7 curriculum objectives while integrating interactive elements for student engagement and understanding.

Math Flipbook garnered positive feedback from both experts and students, and improved the performance of latter, underscoring its potential to enhance learning outcomes and prepare students for future success in the workforce and society.



Summary of Results

The study focused on developing a catch-up material specifically Math Flipbook using the Agile Model to improve student performance in Operations on Integers. Through Requirement Analysis, it was established that catch-up materials in this area were necessary due to its fundamental importance in mathematics education. Adventure and Anime/comics/cartoon, having the highest and the same mean score of 3.26 and a “Very Interested” description, emerged as the most preferred themes for the flipbook of 254 Grade 7 students from different schools offering Junior High School in San Isidro, indicating student interest in interactive and visually appealing materials.

In the Design Phase, thorough planning was undertaken to align the flipbook with Grade 7 learning objectives while incorporating engaging elements from the preferred themes. The flipbook was carefully designed to ensure consistency with DepEd Learning Competencies, and it also implicitly follows the parts of modules prescribed by DepEd to maximize student engagement.

For the theme, the researcher combined the characteristics of Adventure and Anime/comics/cartoon leading to the idea of using Detective Conan, renowned for its captivating adventures and originating as a comic series, as a theme for the Math Flipbook. This choice not only demonstrates creativity but also ensures engagement, it captures the interests of the participants. Moreover, the problem-solving and deductive reasoning inherent in Detective Conan reflect the cognitive processes involved in mathematical



thinking, thereby enhancing the alignment with the learning objectives and with the subject.

During the Development Phase, multimedia content creation and flipbook design were executed using tools like Canva and Heyzine. Other specific designs were made with the help of PowerPoint Animaker, Videocartoonizer, and Inshot. The flipbook's content was structured following a storyline to enhance students' understanding of integer operations through interactive and visually stimulating materials.

Subsequently, in the Testing Phase, the developed flipbook underwent thorough evaluation by experts. This evaluation encompassed content quality, instructional quality, technical quality, and usability characteristics, including Multimedia Design, Overall Interface, Behavior of Controls & System Information, Customizability/Support for User Preferences, and Hyperlinks. The flipbook received high ratings across all dimensions, with overall mean of 3.92 and an overall standard deviation of 0.27, indicating that the experts are very satisfied with the fulfillment of all the factors for the Math Flipbook and proving its readiness in deployment to its intended users as a catch-up material.

Upon successful testing, the flipbook was deployed to 254 Grade 7 students that constitute the Deployment Phase. Though at the beginning, technical problems like internet connectivity and email-related concerns caused delay, students showed significant improvement in test scores, as t-test results comparing test scores of grade 7 students before and after using Math Flipbook ($t=-24.151$; $p<0.05$), indicates the flipbook's efficacy in improving their understanding of Operations on Integers. Moreover, it also garnered



students favor having all factors consistently rated as "Very Satisfactory" with overall mean of 3.97 and a standard deviation of 0.17. Their feedback also reflected high satisfaction with the flipbook's content, instructional quality, technical aspects, and usability characteristics.

Limitations

Considering the limitations of this study, it is important to acknowledge that while the research provides valuable insights into the effectiveness of the Math flipbook as catch-up material for Grade 7 students in improving performance in Operations on Integers, there are important concerns that need to be addressed.

The study's focus on Grade 7 students may limit the generalizability of findings to other grade levels or educational contexts. Variations in cognitive development, prior knowledge, and learning styles across different age groups could influence the effectiveness of the flipbook. Additionally, the unique curriculum requirements and instructional approaches adopted in various educational settings may impact the applicability of the findings.

Another is the study's reliance on digital technology introduces several limitations that needs consideration. Technical constraints such as internet connectivity issues and email access limitations may hinder some students' ability to smoothly utilize the flipbook. Not all students may have consistent access to the internet or devices necessary to interact with the flipbook, which could introduce bias into the study and limit the generalizability of the findings. Additionally, though the Math flipbook will run in smartphones, tablets,



laptop, or PC, the effectiveness of the flipbook may also be influenced by the technical specifications of the devices used by students like variability in hardware capabilities, screen sizes, and internet speeds could affect the user experience and potentially impact the outcomes of the study. Moreover, software limitations may restrict the functionality of the digital learning platform. The functionalities and features of the software used to develop the flipbook, like the video, audio, image quality, may impose constraints on the design and implementation process.

Conclusions

To sum up, the development and implementation of the Math Flipbook through Agile Model designed to improve students' performance in Operations on Integers, has yielded significant insights and outcomes. Through a thorough process following the mentioned model starting from Requirement Analysis, Design, Development, Testing to Deployment, the study has contributed to the advancement of educational technology and pedagogy in mathematics education.

The Requirement Analysis phase underscored the importance of incorporating student preferences into instructional materials. By identifying Adventure and Anime/comics/cartoon as the most preferred themes, the study ensured that the flipbook reflected the students, encouraging engagement and motivation.

In the Design phase, careful alignment with DepEd Learning Competencies and prescribed module parts were prioritized to ensure the flipbook's educational relevance and effectiveness. The integration of interactive elements and multimedia content aimed to



create dynamic learning experience, catering to diverse learning styles and preferences without sacrificing the content.

Development involved the creation of multimedia content and the design of Math flipbook using various tools, offline and online platforms. With the used of main technologies such as Canva and Heyzine, the study produced a visually appealing and user-friendly resource that seamlessly integrated videos, images, and interactive features. This highlights the study's commitment to providing an enriched catch-up learning experience for students.

The Testing phase constituted thorough evaluation by experts, which revealed high levels of satisfaction across content, instructional quality, technical aspects, and usability characteristics. The flipbook's very satisfactory ratings affirm its excellence in delivering educational content and facilitating meaningful learning experiences.

Deployment of the Math Flipbook resulted in a significant improvement in student test scores, tangible evidence, indicating its efficacy as a catch-up material in mathematics education. The positive feedback from students and educators further validates its impact and relevance in improving student learning outcomes.

Despite these achievements, the study is not without limitations. Technical issues related to internet connectivity and email access may hinder access for some students, highlighting the importance of addressing technological challenges. Additionally, the study's focus on Grade 7 students may limit generalizability and depth of analysis.



Finally, the Math Flipbook represents a significant advancement in instructional technology, offering a comprehensive and engaging resource for teaching Math, particularly Operations on Integers. Its success underscores the importance of student-centered design and the integration of multimedia elements in educational materials. Moving forward, continuous improvement, teacher training, and addressing technical challenges will be essential to maximizing the flipbook's impact and ensuring equitable access to quality education for all students.

Recommendations

Extend the deployment of the Math Flipbook to encompass broader grade levels and educational contexts beyond Grade 7. Consider adapting the flipbook to cater to the specific learning objectives and needs of diverse student populations across different grade levels.

Continuously improve the Math flipbook to ensure its alignment with evolving educational standards and pedagogical best practices. Regular updates and enhancements should be made as platform features updates like future integration of Artificial Intelligence (AI).

For professional development, comprehensive teacher training on effectively integrating the flipbook into curriculum and teaching practices is highly suggested. Equipping teachers with the necessary skills and knowledge will optimize the flipbook's utilization and impact on student learning.



Address technical issues related to internet connectivity and email access to ensure all students can fully utilize the flipbook. Continuously explore options for offline access or alternative distribution methods to reach students with limited digital resources without sacrificing the content.

It is recommended to adopt student-centered approaches that prioritize active participation, collaboration, and personalization to enhance student involvement in instructional materials or catch-up such as the Math Flipbook. By empowering students to play a central role in the design, development, and utilization of instructional materials, teachers can foster a culture of engagement, ownership, and meaningful learning experiences that cater diverse needs and preferences of learners.

Further study, like longitudinal studies is suggested to assess the long-term impact of using flipbook not only as catch-up material but as instructional materials on student learning outcomes, retention, and academic achievement across different grade levels and even subject areas.

Additionally, comparative studies could be undertaken to evaluate the effectiveness of flipbook-based instruction in comparison to traditional textbooks or other digital learning resources.

Further adaptation of Agile Model in mathematics education is also recommended. The application of this model is suggested for both basic and higher education, whether for the development of instructional material or the establishment of the curriculum.



REFERENCES

- Abror, M., Suriani, N. & Tri Ardianto, D. (2019). Digital flipbook empowerment as a development means for history learning media. *Jurnal Pendidikan Indonesia*, 8(2), 266-275. DOI: 10.23887/jpi-undiksha.v8i2.24122
- Agile Alliance. (2022). *Agile 101*. Retrieved from: <https://www.agilealliance.org/agile101/>
- Ahmed, A., Ahmad, S., Ehsan, N., Mirza, E. & Sarwar, S.Z. (2010). Agile software development: Impact on productivity and quality. *Proceedings 2010 IEEE International Conference on Management of Innovation and Technology*, 287-291. DOI: 10.1109/ICMIT.2010.5492703
- Alcantara, M.A. (2015). Development and evaluation of learning modules in algebra. [Thesis, Laguna State Polytechnic University]. Retrieved from https://www.academia.edu/33347558/DEVELOPMENT_AND_EVALUATION_OF_LEARNING_MODULES_IN_ALGEBRA
- Ali, H. H., & Jameel, H. T. (2016). Causes of Poor Performance in Mathematics from Teachers, Parents and Student's Perspective. *American Academic Scientific Research Journal for Engineering, Technology, and Sciences*, 15(1), 122-136. Retrieved from https://asrjetsjournal.org/index.php/American_Scientific_Journal/article/view/1212



- Andini, S., Budiyono, & Fitriana, L. (2018). Developing flipbook multimedia: The achievement of informal deductive thinking level. *Journal on Mathematics Education*, 9(2), 227-238. Retrieved from <https://doi.org/10.22342/jme.9.2.5396.227-238>.
- Antigua, R.A. (2017). *Development and evaluation of an interactive learning module on the geometry of circles using comics*. (Thesis, University of the Philippines Los Baños). Retrieved from https://www.academia.edu/42156995/DEVELOPMENT_AND_EVALUATION_OF_AN_INTERACTIVE_LEARNING_MODULE_ON_THE_GEOMETRY_OF_CIRCLES_USING_COMICS
- Arsyad, A. (2011). *Learning Media* [in Bahasa]. Jakarta: Rajawali Pers
- Ashraf, M. A., Shamail, S., & Rana, Z. A. (2012). Agile model adaptation for E-learning students' final-year project. *Proceedings of IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE) 2012*, T1C-18-T1C-21. doi:10.1109/TALE.2012.6360375.
- Ayaz, M.F. & Şekerci, H. (2015). The effects of the constructivist learning approach on student's academic achievement: A meta-analysis study. *Turkish Online Journal of Educational Technology*, 14, 143-156. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1077612.pdf>



- Bernardo, J. (2020, December 9). PH ranks last among 58 countries in Grade 4 math, science: study. ABS-CBN New. Retrieved from [https://news.abs-cbn.com/news/12/09/20/ph-ranks-last-among-58-countries-in-grade-4-math-science-study#:~:text=The%20Philippines%20scored%2029%20in,of%20Educational%20Achievement%20\(IEA\).](https://news.abs-cbn.com/news/12/09/20/ph-ranks-last-among-58-countries-in-grade-4-math-science-study#:~:text=The%20Philippines%20scored%2029%20in,of%20Educational%20Achievement%20(IEA).)
- Boehm, B. & Turner, R. (2003). *Balancing agility and discipline: A guide for the perplexed*. Addison, Wesley.
- Bolivar, J. K. G. (2013). *Development and evaluation of Web-based interactive learning module on cellular division*. [Unpublished Special Problem, IBS-UPLB].
- Branch, R.M. (2009). Prologue. In: *Instructional Design: The ADDIE Approach*. Springer, Boston, MA. Retrieved from https://doi.org/10.1007/978-0-387-09506-6_1
- Bray, A., & Tangney, B. (2017). Technology usage in mathematics education research—A systematic review of recent trends. *i*, 114, 255-273. Retrieved from <https://doi.org/10.1016/j.compedu.2017.07.004>.
- Bruner J. (1986). *Actual minds, possible worlds*. Cambridge, MA: Harvard University Press.
- Capinding, A. T. (2022). Impact of modular distance learning on high school students mathematics motivation, interest/attitude, anxiety and achievement during the



covid-19 pandemic. *European Journal of Educational Research*, 11(2), 917-934.

Retrieved from <https://doi.org/10.12973/eu-jer.11.2.917>

Cater, C. (2013). The meaning of adventure. *Adventure tourism: Meanings, experience and learning*, 7-18.

https://books.google.com.ph/books?hl=en&lr=&id=QvEcyR0LJREC&oi=fnd&pg=PA7&dq=meaning+of+Adventure&ots=MpS_9s6Prz&sig=DGUK5aS0LECDNFJNt7u1gfAQ4iA&redir_esc=y#v=onepage&q=meaning%20of%20Adventure&f=false

Cho, H. (2012). *The use of cartoons as a teaching tool in middle school mathematics*. [Dissertation, Columbia University]. Columbia University ProQuest Dissertations Publishing. Retrieved from <https://www.proquest.com/docview/1038140657>

Clark, R.C., & Mayer, R.E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). John Wiley & Sons, Inc.

Cohen, L., Manion, L., & Morrison, K. (2000). *Research methods in education*. London: Routledge Falmer. Retrieved from <http://dx.doi.org/10.4324/9780203224342>

Columbano, M. Q. (2019). Development and validation of modules in basic mathematics to enhance students' mathematics performance. *International Journal of Innovative*



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

Technology and Exploring Engineering. 8(12), 4203-4207. DOI:
10.35940/ijitee.L2684.1081219

Davis, L.L. (1992). Instrument review: getting the most from your panel of experts.
Applied Nursing Research, 5, 194-197

De Jesus, E. C. (2005). *Instructional module for teaching mathematics using
computer-aided instructions*. [Unpublished Master's Thesis]. Pamantasan ng
Lungsod ng Maynila, Manila.

Department of Education (DepEd) Order No. 160, Maximizing Utilization of the National
Achievement Test (NAT) Results to Raise the Achievement Levels in Low
Performing Schools (2012).

Department of Education Region 2. (2019). *2018 National achievement test (NAT) 6, 10,
12 results and analysis*. Tuguegarao City: Department of Education Cagayan
Valley. Retrieved from [https://region2.deped.gov.ph/wp-
content/uploads/2019/05/2018-NATIONAL-ACHIEVEMENT-TEST-NAT-610-
12-RESULTS-AND-ANALYSIS-.pdf](https://region2.deped.gov.ph/wp-content/uploads/2019/05/2018-NATIONAL-ACHIEVEMENT-TEST-NAT-610-12-RESULTS-AND-ANALYSIS-.pdf)

Department of Education, United Nations International Children's Emergency Fund,
Southeast Asia Primary Learning Metrics & Southeast Asia Ministers of Education
Organization. (2021). *SEA-PLM 2019 National Report of the Philippines*.
Retrieved from



<https://www.unicef.org/philippines/media/2556/file/Southeast%20Asia%20Primary%20Learning%20Metrics%202019%20National%20Report%20of%20the%20Philippines.pdf>

Department of Education. (2019). *PISA 2018 Philippine National Report*. Pasig City:

Department of Education. Retrieved from <https://www.deped.gov.ph/wp-content/uploads/2019/12/PISA-2018-Philippine-National-Report.pdf>

Department of Education. (2012). *K to 12 curriculum guide*. Retrieved from

https://www.deped.gov.ph/wp-content/uploads/2019/01/Math-CG_with-tagged-math-equipment.pdf

Department of Education. (2020). Mathematics curriculum guide. Retrieved from

<https://dcpnhs.net/wp-content/uploads/2020/06/Mathematics-MELCs.pdf>

Department of Education. (2022). *Basic education development plan*. Pasig City:

Department of Education. Retrieved from <https://www.deped.gov.ph/wp-content/uploads/2022/07/BEDP-2030-Photo-Documentation.pdf>

DepEd Order No 12. (2020). *Learning opportunities shall be available: The basic*

education learning continuity plan. Pasig City: Department of Education.

Retrieved from https://www.deped.gov.ph/wp-content/uploads/2020/07/DepEd_LCP_July3.pdf



- Dewi, D. A., & Muniandy, M. (2014). The agility of agile methodology for teaching and learning activities. *2014 8th. Malaysian Software Engineering Conference (MySEC)*, 255–259. doi: 10.1109/MySec.2014.6986024.
- Domanais, M. (2019). Making sense of integer operations through peer tutoring. *Ascendens Asia Journal of Multidisciplinary Research*, 3(2). Retrieved from <https://ojs.aaresearchindex.com/index.php/AAJMRA/article/view/8836>
- Dooley, J. & Swanberg, T. (1989). *PVC's mathematics module*. SEDP Handout.
- Educational Communications and Technology
- Egan, K. (1997). *The Educated Mind: How Cognitive Tools Shape Our Understanding*. Chicago: The University of Chicago Press.
- Ertmer, P. A., & Newby, T. J. (2013). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly*, 26(2), 43-71.
- Escamilla-Fajardo, P., Alguacil, M., & López-Carril, S. (2021). Incorporating TikTok in higher education: Pedagogical perspectives from a corporal expression sport sciences course. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 28, 100302. doi:10.1016/j.jhlste.2021.100302
- Evenddy, S. S., Hamer, W., Pujiastuti, H., & Haryadi, R. (2021). The development of 3D flipbook E-learning module of english mathematics profession. *IOP Conference*



Series: Earth and Environmental Science, 1796(1), 1–8. Retrieved from <https://doi.org/10.1088/1742-6596/1796/1/012017>

Fachrunisa, A., Kuncoro, K.S., Arigiyati, T.A. (2022). Development of interactive E-modules assisted by the kvisoft flipbook maker application on algebraic forms grade vii. *Journal of Mathematics and Mathematics Education*, 12(1). Retrieved from <http://dx.doi.org/10.20961/jmme.v12i1.61091>.

Fronza, I., Ioini, N. E. & Corral, L. (2017). Teaching computational thinking using agile software engineering methods: A framework for middle schools. *ACM Transactions on Computing Education*, 17(4), 1–28. DOI:10.1145/3055258

Gaikwad, N. & Tankhiwale, S. (2014). Interactive E-learning module in pharmacology: A pilot project at a rural medical college in India. *Perspective on Medical Education* 3, 15–30. Retrieved from <https://doi.org/10.1007/s40037-013-0081-0>

Goh, L. S., Tengah, K. A., Shahrill, M., Tan, A., & Leong, E. (2017). Teaching and learning of integers using hands-on versus virtual manipulatives. Paper presented at the 3rd International Conference on Education 2017 (ICEDU 2017), Kuala Lumpur, Malaysia, 20-22 April 2017. DOI:10.17501/icedu.2017.3119

Gonzales, E. (2019, December 29). YEAR-END REPORT: DepEd in 2019: The quest for quality education continues. *Manila Bulletin*. Retrieved from



<https://mb.com.ph/2019/12/29/year-end-report-deped-in-2019-the-quest-for-quality-education-continues/>

Gueta, M.F. and Janer, S.S. (2021). Distance learning challenges on the use of self-learning module. *United International Journal for Research & Technology (UIJRT)*, 2(7), 58-71.

Hafni, R.N., Herman, T., Nurlaelah, E. & Mustikasari, L. (2020). The importance of science, technology, engineering, and mathematics (STEM) education to enhance students' critical thinking skill in facing the industry 4.0. *Journal of Physics*, 1521(4). Retrieved from DOI 10.1088/1742-6596/1521/4/042040

Herrera, C.D., & Dio, R.V. (2016). Extent of readiness of grade 10 students for general mathematics of senior high school in sorsogon city, Philippines. *Asia Pacific Journal of Education, Arts and Sciences*, 3(4), 1-8.

Holt-Reynolds, D. (2000). What does the teacher do?: Constructivist pedagogies and prospective teachers' beliefs about the role of a teacher. *Teaching and Teacher Education*. 16(1), 21-32. Retrieved from [https://doi.org/10.1016/S0742-051X\(99\)00032-3](https://doi.org/10.1016/S0742-051X(99)00032-3)

Hughes, J.L.(1963). Programmed instruction for schools and industry. *Journal of Chemical Education*, 40(9), 500. Retrieved from <https://doi.org/10.1021/ed040p500.1>

inition and domains of the field. Washington, DC: Association for



- Jais, N. F. M., Ishak, S. A., & Yunus, M. M. (2022). Developing the self-learning interactive module using ADDIE model for year 5 primary school students. *International Journal of Academic Research in Progressive Education and Development*, 11(1), 615–6. Retrieved from <http://dx.doi.org/10.6007/IJARPED/v11-i1/11919>
- Jamwal, G. (2012). *Effective use of interactive learning modules in classroom study for computer science education*. (Thesis, Utah State University). Retrieved from <https://doi.org/10.26076/5031-003e>
- Jazim, Anwar, R. B., & Rahmawati, D. (2017). The use of mathematical module based on constructivism approach as media to implant the concept of algebra operation. *International Electronic Journal of Mathematics Education*, 12(3), 579-583.
- Kaplar, M., Radović, S., Veljković, K., Simić-Muller, K., & Marić, A. (2021). The Influence of Interactive Learning Materials on Solving Tasks That Require Different Types of Mathematical Reasoning. *Int J of Sci and Math Educ* 20, 411–433 Retrieved from <https://doi.org/10.1007/s10763-021-10151-8>
- Kastl, P., Kiesmüller, U., & Romeike, R. (2016). Starting Out with Projects: Experiences with Agile Software Development in High Schools. *Proceedings of the 11th Workshop in Primary and Secondary Computing Education (WiPSCE)*, 60–65. Retrieved from <https://doi.org/10.1145/2978249.2978257>



- Keller, F. S. (1968). "Good-bye teacher". *Journal of Applied Behavior Analysis*, 1, 79-89.
- Kemp, J. E., Morrison, G. R., & Ross, S. M. (1998). *Designing Effective Instruction*. New Jersey: Prentice-Hall Inc.
- Khalid, M. & Embong, Z. (2020). Sources and possible causes of errors and misconceptions in operations of integers. *International Electronic Journal of Mathematics Education*, 15(2), 1-13. Retrieved from <https://doi.org/10.29333/iejme/6265>
- Khalid, M., Othman, J., Ibrahim, M.B., & Embong, Z. (2018). A preliminary study on form 1 students' errors and misconception in operations of integers. *Proceedings of National Education Deans' Council Seminar [Medc 2018]*, Unisza, 7-8 November, 2019
- Kim, B., Williams, R. & Datillo, J. (2002). Students' perception of interactive learning modules. *Journal of Research on Technology in Education*. 34(4), 453-473. Retrieved from <https://doi.org/10.1080/15391523.2002.10782361>
- Kim, J. S. (2005). The effects of a constructivist teaching approach on student academic achievement, selfconcept, and learning strategies. *Asia Pacific Education Review*. 6(1), 7-19. Retrieved from <https://doi.org/10.1007/BF03024963>
- Lapie, A.G.P., Lawas, V.M. & C.M. Lawas (2015). Development and evaluation of an interactive learning module on summation notation using comics. *Proceedings of 7*



th ICMI-East Asia Regional Conference on Mathematics Education. 665-673.

Retrieved from

https://www.academia.edu/72932462/Development_and_evaluation_of_an_interactive_learning_module_on_summation_notation_using_comics

Lechuga, M.L, Faura, J.C & Martínez, U.F. (2020). Mathematics applied to the economy and sustainable development goals: A necessary relationship of dependence. *Multidisciplinary Digital Publishing Institute Education Sciences*. 10(11), 339. <https://doi.org/10.3390/educsci10110339>

Lynn, M.R. (1986). Determination and qualification of content validity. *Nursing Research*, 35, 382-385.

Maamin, M., Maat, S. M., & Iksan, Z. H. (2021). Analysis of the factors that influence mathematics achievement in the asean countries. *Cypriot Journal of Educational Sciences*, 16(1), 371-389. <https://doi.org/10.18844/cjes.v16i1.5535>

Magsambol, B. (2020). 8.8 million parents prefer modular learning for students- DepEd. Retrieved from <https://www.rappler.com/nation/deped-says-parentsprefer-modular-learning-students>

Makonye, J. P., & Fakude, F. (2016). A study of errors and misconceptions in the learning of addition and subtraction of directed numbers in grade 8. *SAGE Open*. SAGE Open, 1-10. <https://doi.org/10.1177/2158244016671375>



- Mayer, R. E. (2014). *Principles for MultiMedia Learning*.
<https://hilt.harvard.edu/blog/principlesmultimedia-learning-richard-e-mayer>.
- Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist*, 38(1), 43-52. Retrieved from
https://doi.org/10.1207/S15326985EP3801_6
- Mayer, R.E., Moreno, R., & Sweller, J. (2015). *E-learning theory*. <https://www.learning-theories.com/e-learning-theory-mayer-sweller-moreno.html>.
- McBride, P. (2020). *What's the difference between a PDF and a Flipbook?* Retrieved from
<https://www.nxtbookmedia.com/blog/whats-the-difference-between-a-pdf-and-a-flipbook/>
- Meerbaum-Salant, O., & Hazzan, O. (2010). An agile constructionist mentoring methodology for software projects in the high school. *ACM Transactions on Computing Education*, 9(4), 21. Retrieved from
<https://doi.org/10.1145/1656255.1656259>
- Meniano, K. R. C., & Tan, R. G. (2022). Challenges in studying mathematics using self-learning module during covid-19 pandemic. *American Journal of Educational Research*, 10(4), 182-187. DOI: 10.12691/education-10-4-4



- Moreno, R. (2006). Learning in High-Tech and Multimedia Environments. *Current Directions in Psychological Science*, 15(2), 63–67. Retrieved from <https://doi.org/10.1111/j.0963-7214.2006.00408.x>
- Mullis, I. V. S., Martin, M. O., Foy, P., Kelly, D. L., & Fishbein, B. (2020). TIMSS 2019 International Results in Mathematics and Science. Boston College, TIMSS & PIRLS International Study Center website. Retrieved from <https://timssandpirls.bc.edu/timss2019/international-results/>
- Murphy, K.L., & Cifuentes, L. (2001). Using web tools, collaborating and learning online. *Distance Education*, 22 (2), 285-305. Retrieved from <https://doi.org/10.1080/0158791010220207>
- Mwaniki, E.W., Njihia, M.S., Chege, F.N., & Ireri, A. (2016). Development of interactive online learning modules: Lessons from kenyatta university, kenya. *PCF8 Conference Organized by Commonwealth of Learning*. Retrieved from <https://oasis.col.org/colserver/api/core/bitstreams/6fb88b24-ff97-4b94-9009-9725ffc1e7e4/content>
- Ng'andu, Hambulo, F., Haambokoma, N. & Milingo, T. (2013). The contribution of behavioral theories of learning to education. *Zambia Journal of Education*. 4(1),58-74. Retrieved from



https://www.researchgate.net/publication/341313372_The_Contribution_of_Behavioral_Theories_of_Learning_to_Education

Niess, M. L. & Walker, J. M. (2010). Guest editorial: Digital videos as tools for learning mathematics. *Contemporary Issues in Technology and Teacher Education*, 10 (1), 100-105. Retrieved from <https://www.learntechlib.org/primary/p/34122/>.

Noguera, I., Guerrero-Roldán, A.-E., & Masó, R. (2018). Collaborative agile learning in online environments: Strategies for improving team regulation and project management. *Elsevier*, 116, 110–129. Retrieved from <https://doi.org/10.1016/j.compedu.2017.09.008>

Obias, J. M. F. (2012). Development and evaluation of interactive learning module on second-order determinants and cramer's rule on system of linear equations. [Unpublished Special Problem, IMSP-UPLB]

Organization for Economic Co-operation and Development. (2018). *Philippines students' performance* 2018. Retrieved from <https://gpseducation.oecd.org/CountryProfile?primaryCountry=PHL&treshold=5&topic=PI>

Organization for Economic Co-operation and Development. (2019). PISA 2018 Assessment and Analytical Framework. PISA, OECD Publishing, Paris. Retrieved from <https://doi.org/10.1787/b25efab8-en>.



Organization for Economic Co-operation and Development. (2023). PISA 2022 Assessment and Analytical Framework. PISA, OECD Publishing, Paris. Retrieved from <https://doi.org/10.1787/dfe0bf9c-en>

Paspasan, R. M. (2015). Structured approach vs self – paced modular approach in teaching trigonometry. *Asia Pacific Journal of Multidisciplinary Research*, 3(5), 51-58. Retrieved from <http://www.apjmr.com/wp-content/uploads/2016/01/APJMR-2015-3.5.2.07.pdf>

Pe Dangle, Y. R. (2020). The implementation of modular distance learning in the philippine secondary public schools. *Proceedings of The 3rd International Conference on Advanced Research in Teaching and Education*. DOI:10.33422/3rd.icate.2020.11.132

Philippine Institute for Development Studies. (2022, September 29). *UNICEF chief urges PH to recover learning losses from the COVID-19 pandemic*. Retrieved from <https://www.pids.gov.ph/details/news/press-releases/unicef-chief-urges-ph-to-recover-learning-losses-from-the-covid-19-pandemic>

Polit, D. F. & Beck, C. T. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health*, 29, 489-497. DOI: 10.1002/nur.20147



- Rakoczy, K., Pinger, P., Hochweber, J., Klieme, E., Schütze, B. & Besser, M. (2019). Formative assessment in mathematics: Mediated by feedback's perceived usefulness and students' self-efficacy. *Learning and Instruction*, 60(1), 154-165. Elsevier Ltd. Retrieved from <https://www.learntechlib.org/p/208135/>.
- Razzaq R., Ostrow K.S., & Heffernan N.T. (2020). Effect of immediate feedback on math achievement at the high school level. In: Bittencourt I., Cukurova M., Muldner K., Luckin R., Millán E. (eds) *Artificial Intelligence in Education. AIED 2020. Lecture Notes in Computer Science*, 12164, 263-267. Springer, Cham. Retrieved from https://doi.org/10.1007/978-3-030-52240-7_48
- Richey, R. (1994). Developmental research: definition and scope. *Educational Communication and Technology*, 16, 714. Retrieved from <https://gtu.ge/Agro-Lib/RESEARCH%20METHOD%20COHEN%20ok.pdf>
- Richey, R. C. & Klein, J. D. (2005). Developmental research methods: Creating knowledge from instructional design and development practice. *Journal of Computing in Higher Education*, 16(2), 23-38. Retrieved from https://myweb.fsu.edu/jklein/articles/Richey_Klein_2005.pdf
- Richey, R.C., Klein, J. D., & Nelson, W. (2004) Developmental research: Studies of instructional design and development. In D. Jonassen (Ed.) *Handbook of Research for Educational Communications and Technology* (2nd ed.) (1099-1130). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.



- Romeike, R., & Göttel, T. (2012). Agile projects in high school computing education: Emphasizing a learners' perspective. *Proceedings of the 7th Workshop in Primary and Secondary Computing Education (WiPSCE)*, 48–57. Retrieved from <https://doi.org/10.1145/2481449.2481461>
- Rondillas, F. I., & Buan, A. T. (2019). Development of an Interactive Module Incorporating Financial Literacy in Teaching Decimals/Fraction. In *Journal of Physics: Conference Series*. 1340(1), 12049). IOP Publishing. DOI 10.1088/1742-6596/1340/1/012049
- Sacolick, I. (2022, April 8). *A brief history of the agile methodology*. Retrieved from: <https://www.infoworld.com/article/3655646/a-brief-history-of-the-agile-methodology.html>
- Sadiq, S. & Zamir, S. (2014). Effectiveness of modular approach in teaching at universal level. *Journal of Education and Practice*, 5(17), 103-109. Retrieved from <https://www.iiste.org/Journals/index.php/JEP/article/view/13916>
- Salza, P., Musmarra, P. & Ferrucci, F. (2019). Agile Methodologies in Education: A Review. In: Parsons D., MacCallum K. (eds) *Agile and Lean Concepts for Teaching and Learning*. Springer, Singapore. Retrieved from https://doi.org/10.1007/978-981-13-2751-3_2



- San Mateo, M.L.D. (2021). DOST courseware module: a tool in enhancing students' performance in grade 10 mathematics. *International Journal of Research Publications*, 80(1), 114-125. doi:10.47119/IJRP100801720212089
- Saul, D.J. (2004). The labor support questionnaire: development of psychometric analysis. *Journal of Nursing Measurement*, 12, 123-312.
- Seels, B. B., & Richey, R. C. (1994). Instructional technology: The def-
- Seels, B. B., & Richey, R. C. (1994). *Instructional technology: The definition and domains of the field*. Washington, DC: Association for Educational Communications and Technology
- Segal, J. & Morris C. (2008). Developing scientific software. *IEEE Software*, 25, 18-20. DOI: 10.1109/MS.2008.85
- Sejpal, K. (2013). Modular method of teaching. *International Journal for Research Education*, 2(2), 169-171. Retrieved from https://raijmronlineresearch.files.wordpress.com/2017/07/29_169-171-dr-kandarp-sejpal.pdf
- Şentürk, M., and Şimşek, U. (2021). Educational comics and educational cartoons as teaching material in the social studies course. *African Educational Research Journal*, 9(2), 515-525. DOI: 10.30918/AERJ.92.21.073



Setiyani, Putri, D.P., Ferdianto, F., & Fauji, S.H. (2020). Designing A Digital Teaching Module based on Mathematical Communication in Relation and Function. *Journal on Mathematics Education*, 11(2), 223-236. Retrieved from <http://doi.org/10.22342/jme.11.2.7320.223-236>.

Shambaugh, N., & Magliaro, S. G. (2006). *Instructional Design: A Systematic Approach for Reflective Practice*. United States of America: Pearson Education Inc.

Sharma, S., Sarkar, D. & Gupta, D.(2012). Agile processes and methodologies: A conceptual study. *International Journal on Computer Science and Engineering*, 4(5), 892-898. Retrieved from https://www.researchgate.net/publication/267706023_Agile_Processes_and_Methodologies_A_Conceptual_Study

Shrout, P.E & Fleiss, J.L.(1979). Intraclass correlations: uses in assessing rater reliability. *Psychological Bulletin*, 86(2), 420-428. <https://doi.org/10.1037/0033-2909.86.2.420> Alsina, C., & Nelsen, R. B. (2006). *Math Made Visual: Creating Images for Understanding Mathematics*. United States of America: The Mathematical Association of America. Retrieved from <https://doi.org/10.5948/UPO9781614441007>

Stout, P.A., Villegas, J., & Kim, H. (2001) Enhancing learning through use of interactive tools on health-related websites. *Health Education Research*, 16 (6), 721-733. Retrieved from <https://doi.org/10.1093/her/16.6.721>



- Taylor, P. C., Fraser, B. J., & Fisher, D. L. (1997). Monitoring constructivist classroom learning environments. *International Journal of Educational Research*, 27(4), 293-302. Retrieved from [https://doi.org/10.1016/S0883-0355\(97\)90011-2](https://doi.org/10.1016/S0883-0355(97)90011-2)
- Trapane, H.G.(2016). *Development of supplementary instructional material on selected topics in geometry and statistics for grade seven students*. [Seminar Paper, Philippine Normal University]. Retrieved from [pnu-onlinecommons.org/omp/index.php/pnu-oc/catalog/book/461](https://onlinecommons.org/omp/index.php/pnu-oc/catalog/book/461)
- United Nations Educational, Scientific and Cultural Organization (2022). *Learning Recovery and addressing the learning crisis in the Asia Pacific*. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000381978/PDF/381978eng.pdf.multi>
- United Nations Educational, Scientific and Cultural Organization & United Nations International Children's Emergency Fund. (2021). *5-Year Progress Review of SDG 4 –Education 2030 in Asia-Pacific*. UNESCO. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000379173>
- United Nations Educational, Scientific and Cultural Organization (2022). *Learning Recovery and addressing the learning crisis in the Asia Pacific*. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000381978/PDF/381978eng.pdf.multi>
- Vinitha, K., Ambrose Prabhu, R., Bhaskar, R. & Hariharan, R. (2020). Review on industrial mathematics and materials at industry 1.0 to industry 4.0. *Materials Today*:



Proceedings, 33(7), 3956-3960. Retrieved from
<https://doi.org/10.1016/j.matpr.2020.06.331>

Vivian, R., Falkner, K., & Falkner, N. (2013). Analysing computer science students' teamwork role adoption in an online self-organised teamwork activity. *Proceedings of the 13th Koli Calling International Conference on Computing Education Research*, 105–114. Retrieved from <https://doi.org/10.1145/2526968.2526980>

Wang, V. C. (2012). Understanding and promoting learning theories. *International Journal of Multidisciplinary Research and Modern Education*. 8(2), 343-347.

Wijaya, J. E. & Vidiанти, A. (2020). The effectiveness of using interactive electronic modules on student learning outcomes in education innovation course. *International Conference on Progressive Education*, 422, 86-89. Retrieved from <https://doi.org/10.2991/assehr.k.200323.096>

Yalman, M. (2015). Preservice teachers' views about e-book and their levels of use of e-books. *Procedia-Social and Behavioral Sciences*, 176, 255-262. Retrieved from <https://doi.org/10.1016/j.sbspro.2015.01.469>.

Yazon, A.D. (2018). Validation and effectiveness of module in assessment of students learning. *International Journal of Science and Research*, 7(11), 1833-1836. Retrieved from <https://doi.org/10.21275/ART20193221>

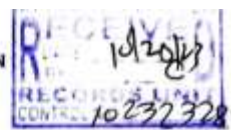


PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

APPENDICES

SAMPLE REQUEST LETTER

PHILIPPINE NORMAL UNIVERSITY – NORTH LUZON
The National Center for Teacher Education
The Indigenous Peoples Education Hub
North Luzon
Alicia, Isabela



October 16, 2023

RACHEL R. LLANA, PhD, CESO V
Schools Division Superintendent
Office of the Schools Division Superintendent
Schools Division of Isabela

Dear DR. LLANA:

Christian greetings!

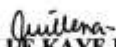
I am Rochelle Kaye I. Villena, a student of Master of Arts in Mathematics Education at Philippine Normal University-North Luzon, Alicia, Isabela. I am currently working on my thesis titled *Catch-Up Material in Operations on Integers Using Flipbook Through Agile Model*.

This undertaking primarily aims to improve the student's performance in Operations on Integers using flipbook through Agile Model. In connection with this, may I earnestly seek from your office a permission to conduct the study in the Division of Isabela, specifically to Grade 7 students and math teachers from public secondary schools in Isabela.

Rest assured that all data will be taken with utmost care and confidentiality and used only for research purposes.

Thank you very much as I hope for your affirmative response.

Respectfully yours,


ROCHELLE KAYE I. VILLENA
Researcher

Noted by:


DR. ROLDAN S. CARDONA
Adviser

Approved by:


RACHEL R. LLANA, PhD, CESO V
Schools Division Superintendent



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

PHILIPPINE NORMAL UNIVERSITY — NORTH LUZON
The National Center for Teacher Education
The Indigenous Peoples Education Hub
North Luzon
Alicia, Isabela

November 8, 2023

PRECILLA S. ROMERO
Principal II
San Isidro National High School
Gomez, San Isidro, Isabela

Madam:

Christian greetings!

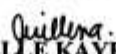
I am Rochelle Kaye I. Villena, a student of Master of Arts in Mathematics Education at Philippine Normal University-North Luzon, Alicia, Isabela. I am currently working on my thesis titled *Catch-Up Material in Operations on Integers Using Flipbook Through Agile Model*.

This undertaking primarily aims to improve the student's performance in Operations on Integers using flipbook through Agile Model. In connection with this, may I earnestly seek from your office a permission to conduct the study in your school, specifically to Grade 7 students and math teacher/s.

Rest assured that all data will be taken with utmost care and confidentiality and will be used only for research purposes.

Thank you very much as I hope for your affirmative response.

Respectfully yours,


ROCHELLE KAYE I. VILLENA
Researcher

Noted by:


DR. ROLDAN S. CARDONA
Adviser

Approved by:


PRECILLA S. ROMERO
Principal II



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

ENDORSEMENT



Republic of the Philippines
Department of Education
REGION II – CAGAYAN VALLEY
SCHOOLS DIVISION OF ISABELA

1st Indorsement
October 24, 2023

Respectfully returned to **ROCHELLE KAYE I. VILLENA**, Graduate School Student, Philippine Normal University-North Luzon, Alicia, Isabela, the herein request to conduct a study entitled: *"Catch-up Material in Operations on Integers Using Flipbook Through Agile Model"*, with the information that said request is APPROVED, provided that there is no disruption of classes.

It is expected that Ms. Villena should submit a copy of her manuscript to this office after its completion for reference purposes.


RACHEL R. LLANA, PhD, CESO V
Schools Division Superintendent



Alibagu, City of Ilagan, Isabela 3300
(078) 323-0281; (078) 323-2015
isabela@deped.gov.ph

 deped-isabela.com.ph
 Sdo.isabela



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

SAMPLE ASSENT FORM

PHILIPPINE NORMAL UNIVERSITY – NORTH LUZON
The National Center for Teacher Education
The Indigenous Peoples Education Hub
North Luzon
Alicia, Isabela

ASSENT FORM

Date _____

Title of the Study: CATCH-UP MATERIAL IN OPERATIONS ON INTEGERS USING FLIPBOOK THROUGH AGILE MODEL

The researcher is humbly inviting your daughter/son to be part of this study. This study seeks to improve students' performance in Operations on Integers by implementing a flipbook developed through the Agile Model.

The researcher aims to involve about 200 participants in this study. Your contribution is integral to achieving the objectives of this study.

Participants participation involves answering questionnaires, using the developed flipbook on operations on integers, and providing essential data for the study.

There are no risks associated with this study. The questionnaire is non-intrusive, and participation is entirely voluntary. If your child experiences any discomfort, he/she is free to withdraw from the study without consequence at any time without providing a reason, and your decision will not impact the current or future relationship of your child with the school.

Personal information will be treated with the utmost confidentiality, and data will be securely stored. Anonymized and aggregate reporting will ensure that your child's identity remains confidential. Individual participants will not be identifiable in any publications or presentations.

By participating, you and your child contribute to the improvement of educational materials and methodologies, potentially benefiting future students. Additionally, the insights gained from this study may have broader implications for educational practices.

Since the flipbook to be developed will only be available online, if needed, the researcher will provide load allowance to those students who do not have internet access.

For any questions or concerns about the study, please feel free to contact the researcher. Phone number: 09556235196; e-mail: villena.rki@pnu.edu.ph; facebook: Rochelle Kaye Ignacio Villena.

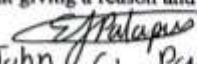
Parent/Guardian Consent:

I have read and understood the information provided above. I voluntarily agree to let my child participate in this research study. I have discussed this study with my child, and they provided their assent to participate.


EMERSON D. PALAPUZ
Signature over Printed Name of Parent/Guardian

Minor Assent:

I have read and understood the information provided above. I voluntarily agree to participate in this research study. I understand that I can stop participating at any time without giving a reason and without any negative consequences.


Earl John C. Palapuz
Signature over Printed Name of Respondents



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

SAMPLE INFORMED CONSENT FORM

PHILIPPINE NORMAL UNIVERSITY – NORTH LUZON
The National Center for Teacher Education
The Indigenous Peoples Education Hub
North Luzon
Alicia, Isabela

Informed Consent Form

Date

Sir/Madam:

I am working on my research study titled CATCH-UP MATERIAL IN OPERATIONS ON INTEGERS USING FLIPBOOK THROUGH AGILE MODEL in partial fulfillment of the requirements leading to the degree Master of Arts in Mathematics Education at Philippine Normal University-North Luzon, Aurora, Alicia, Isabela for the School Year 2023-2024.

The researcher aims to involve Mathematics 7 teachers in this study from San Isidro. Your contribution is integral to achieving the objectives of this study.

Participants participation involves answering questionnaires, using the developed flipbook on operations on integers, and providing essential data for the study.

There are no risks associated with this study. The questionnaire is non-intrusive, and participation is entirely voluntary. If you experience any discomfort, you are free to withdraw from the study without consequence at any time without providing a reason, and your decision will not impact the current or future relationship with the school.

Personal information will be treated with the utmost confidentiality, and data will be securely stored. Anonymized and aggregate reporting will ensure that your identity remains confidential. Individual participants will not be identifiable in any publications or presentations.

By participating, you contribute to the improvement of educational materials and methodologies, potentially benefiting future students. Additionally, the insights gained from this study may have broader implications for educational practices.

For any questions or concerns about the study, please feel free to contact the researcher. Phone number: 09556235196; e-mail: Villena.rki@pnu.edu.ph; facebook: Rochelle Kaye Ignacio Villena.

INFORMED CONSENT

I was informed about the study, and I understood its aim, and I was allowed to ask questions. I understand that this is completely optional, and I am free to withdraw anytime, for any reason and at no expense. I agree to participate in this research.

Participant's Signature

Date: 01-02-2024

Name (optional): FERRY B. TOLENTINO Sex: M Age: _____
Position: TEACHER III No. of year in service: 10
Highest Educ. Attainment: College ☒ Masteral ☐ Doctoral
No. of trainings attended on Module Development: _____
(Please write the title of the seminars on the space provided below, if there is any):



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

SAMPLE INSTRUMENT VALIDATION FORM

PHILIPPINE NORMAL UNIVERSITY – NORTH LUZON
The National Center for Teacher Education
The Indigenous Peoples Education Hub
North Luzon
Alicia, Isabela

Title: **CATCH-UP MATERIAL IN OPERATIONS ON INTEGERS USING FLIPBOOK THROUGH AGILE MODEL**

Researcher: **Rochelle Kaye I. Villena**
Adviser: **Dr. Roldan S. Cardona**

This tool asks for your evaluation of the research instruments to be used in the data gathering for the investigation of the study stated above to establish its validity. You are requested to give your honest assessment using the criteria stated based on the purpose of this study below.

This undertaking primarily aims to improve the student's performance in Operations on Integers using flipbook through Agile Model.

Specifically, this study pursues to:

1. Design the flipbook based on students' theme preference.
2. Develop flipbook in operations on integers
3. Establish the validity and reliability of the flipbook in terms of content quality, instructional quality, technical quality, and usability characteristics:
 - a. Multimedia Design
 - b. Overall Interface
 - c. Behavior of Controls System Information
 - d. Customizability/Support for User Preferences
 - e. Hyperlinks

Students' Flipbook's Theme Preference Survey

Direction: In the Students' Flipbook Theme Preference Survey, learners will assess their level of interest in each theme, using a 4-point Likert scale (1- Not Interested; 2 - Slightly Interested; 3- Interested; 4 - Very Interested) which will be applied in developing a flipbook in operations on integers.

Please indicate the level of relevance of each criterion in relation to the concept of the study by marking the corresponding cell. Kindly provide your comments and suggestions especially on items with ratings of 2 (SR) and 1 (NR).

1 – Not Relevant (NR) 2 – Somewhat Relevant (SR) 3 – Quite Relevant (QR) 4 – Highly Relevant

Flipbook's Theme with Short Description	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
Adventure: Embark on an adventure where you encounter integer-based challenges and puzzles. Use your understanding of operations on integers to solve problems and progress through the adventure, reinforcing your knowledge and skills.				/	
<i>Sumalang sa isang pakikipagsapalaran kung saan makakaranas ka ng mga hamon at palaisipan batay sa Operations on Integers. Gamitin ang iyong pang-unawa</i>					



Flipbook's Theme with Short Description	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
<i>sa Operations on Integers upang malutas ang mga suliranin at magpatuloy sa iyong pakikipagsapalaran, na nagpapatibay ng iyong kaalaman at kasanayan.</i>					
Animals: Explore integer operations through animal-related scenarios and design. Calculate the number of animals in a given population, analyze data on animal behavior or habitat sizes using integers, or solve word problems involving animal. <i>Tuklasin ang Operations on Integers sa pamamagitan ng mga senaryo at disenyo na may kaugnayan sa mga hayop. Tanyahin ang bilang ng mga hayop, suriin ang mga datos tungkol sa mga hayop o sa kanilang tirahan gamit ang mga integer; o lumutas ng mga problema na may kinalaman sa mga hayop.</i>				/	
Anime/manga/cartoons: Immerse yourself in anime/manga/cartoons-inspired scenarios and design, and apply integer operations. Calculate power levels, analyze character statistics, or solve integer-based puzzles within the context of anime/manga storylines. <i>Pag-aralan ang Operations on Integers sa pamamagitan ng mga pangyayari at disenyo na nakabatay sa anime/manga/cartoons. Lumutas ng mga problemang nilalapatan ng kaalaman sa Operations on Integers sa konteksto ng mga kuwento ng mga ito.</i>				/	
Art: Engage in art-related activities that incorporate integer operations. Create art using integers, design geometric patterns with integer dimensions, or apply integer-based calculations for solving art-related word problems. <i>Aralin ang Operations on Integers sa pamamagitan ng mga aktibidad na may kaugnayan sa sining (arts). Lumikha ng sining gamit ang mga integer, magdisenyo ng mga patterns gamit ang integers, o lumutas ng mga palaisipang may kinalaman sa sining at Operations on Integers</i>				/	
Comics: Explore integer operations through comics. Solve integer-related word problems within comic narratives, or create your own comics that involve integer operations as part of the storyline. <i>Tuklasin ang operations on integers sa pamamagitan ng mga komiks. Lumutas ng mga problema na may kaugnayan sa mga integer sa loob ng mga kuwentong komiks, o lumikha ng sarili mong komiks na naglalaman ng operations on integers bilang bahagi ng kuwento.</i>				/	



Flipbook's Theme with Short Description	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
Fantasy: Within a fantasy-themed context, apply integer operations to solve magical puzzles, calculate potion ingredients using integers, or determine the impact of integer-based magical spells on characters or the environment. <i>Lumutas ng mga problema gamit ang operations on integers sa loob ng isang kathang-isip na mundo. Mayroon ditong mahiwagang palaisipan, pagakalkula ng mga sangkap ng potion gamit ang integer; o pagtukoy ng epekto ng mga mahiwagang spells sa mga tauhan o kapaligiran na nakabatay sa mga integer.</i>				/	
Fashion: Use integer operations in fashion-related contexts and design. Determine fabric measurements using integers, calculate discounts or sales prices, or analyze integer-based fashion trends and patterns. <i>Gamitin operations on integers sa mga konteksto at disenyo na may kaugnayan sa fashion. Matukoy ang mga sukat ng tela gamit ang integer; kalkulahin ang mga diskwento o presyo ng mga produkto na naka-sale, o suriin ang mga trend at pattern sa fashion na nakabatay sa mga integer.</i>				/	
Food: Incorporate integer operations into cooking and culinary scenarios and design. Adjust recipe quantities using integers, calculate cooking times or temperatures, or analyze integer-based nutrition facts and portion sizes. <i>Iugnay ang operations on integer sa mga pangyayari at disenyo na may kinalaman sa pagluluto at kusina. Ayusin ang dami ng sangkap sa mga resipe gamit ang integer; kalkulahin ang oras o temperatura ng pagluluto, o suriin ang mga nutrition facts at portion sizes na nakabatay sa mga integer.</i>				/	
Game Show: Participate in game show-inspired activities that involve integer operations. Solve integer-based puzzles, answer integer-related trivia questions, or compete in integer-based challenges. <i>Sumali sa mga gawain na base sa mga game show na naglalaman ng operation on integers. Lumutas ng mga palaisipan na nakabatay sa mga integer, sagutin ang mga trivia na tanong na may kaugnayan sa mga integer.</i>				/	
Horror: Encounter integer-based puzzles or challenges within a horror-themed setting. Solve integer-related codes, unlock doors, or calculate time-based scenarios within the horror storyline.				/	



Flipbook's Theme with Short Description	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
<i>Harapin ang mga palaisipan na nakabatay sa mga integer sa isang horror. Alamin ang mga code na may kaugnayan sa mga integer, buksan ang mga pinto, o lutasin ang mga problema na may kaugnayan sa oras sa loob ng kuwentong horror.</i>					
Movie/book: Analyze integer-related scenarios or problems within movies or books. Calculate distances or time intervals in movie/book settings, solve word problems based on movie/book plots, or analyze integer-related data from movie/book characters. <i>Suriin ang mga pangyayari o problema sa mga pelikula o aklat na may kinalaman sa mga integer. Tanyahin ang mga distansya o mga pagitan ng oras sa mga setting ng pelikula/aklat, lumutas ng mga problema na batay sa mga kuwento ng pelikula/aklat, o suriin ang mga datos na may kaugnayan sa mga integer mula sa mga karakter ng pelikula/aklat.</i>				/	
Music: Incorporate integer operations into music-themed activities. Analyze musical intervals using integers, calculate rhythm durations, or explore integer-based musical patterns and sequences. <i>Isama ang operation on integers sa mga gawain na may temang musika. Sumuri ng musical intervals gamit ang integer, kalkulahin ang rhythm durations, o tuklasin ang mga integer-based musical patterns and sequences</i>				/	
Nature: Apply integer operations to understand natural phenomena. Analyze integer-related data on animal populations, calculate temperature variations, or solve word problems related to natural events using integer operations. <i>Gamitin ang operations on integers upang maunawaan ang mga natural phenomena. Suriin ang mga datos na may kaugnayan sa mga integer tungkol sa populasyon ng mga hayop, kalkulahin ang pagbabago ng temperatura, o malutas ang mga problema na may kinalaman sa mga natural na pangyayari gamit ang operations on integers.</i>				/	
Online Games: Infuse integer operations into interactive online gaming scenarios. Dive into the world of online gaming and learn integer operations while solving in-game puzzles, strategizing with integers, and exploring math challenges within your favorite online games. <i>Ipasok ang operations on integers sa mga interaktibong online gaming na senaryo. Makilahok sa mundo ng</i>					



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

<i>online gaming at matuto ng operations on integers habang lumulutas ng mga puzzle sa loob ng laro, gumagawa ng mga estratehiya gamit ang mga integer, at nagsasaliksik ng mga math challenges sa loob ng iyong mga paboritong online games.</i>					
Pirates: Within a pirate-themed context, face integer-related challenges. Calculate treasure distributions among pirate crews, analyze integer-based map coordinates, or solve word problems involving pirate scenarios and integer operations. <i>Sa loob ng isang konteksto na may temang pirata, harapin mo ang mga hamon na may kinalaman sa mga integer. Kalkulahin ang pamamahagi ng kayamanan sa</i>				/	
Flipbook's Theme with Short Description	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
<i>mga myembro ng mga pirata, suriin ang mga coordinates sa mapa na nakabatay sa mga integer, o lumutas ng mga problema na may kinalaman sa pakikipagsapalaran ng mga pirata.</i>					
Sports: Integrate integer operations into sports-themed activities and design. Analyze sports statistics using integers, calculate scores or rankings, or solve integer-based problems related to sports performance and records. <i>Isama ang operations on integers sa mga gawain at disenyo na may temang palakasan. Suriin ang sports statistics sa palakasan gamit ang integer, kalkulahin ang mga puntos o ranggo, o lutasin ang mga problema na nakabatay sa mga integer na may kaugnayan sa palakasan.</i>				/	

If there is a module theme that you would like to suggest, which is not included in the provided list, please write it in the space provided below:

(Kung mayroon kang ibang nais na tema ng module na hindi kasama sa ibinigay na listahan, mangyaring isulat ito sa espasyong ibinigay sa ibaba:)

You may include a theme related to online games such as ML, LoL, etc.

JOMAR A. FELIX

Signature over printed name of the validator

10/22/2023

Date



Expert and Teacher's Evaluation Rating Sheet

Direction: In the Expert and Teacher's Evaluation Rating Sheet, subject matter experts and Mathematics 7 teachers will assess the extent to which the developed flipbook meets the criteria for Content Quality, Instructional Quality, Technical Quality, and Usability Characteristics using a 4-point Likert scale (4-Very Satisfactory; 3- Satisfactory; 2 – Poor; and 1 – Not Satisfactory).

Please indicate the level of relevance of each criterion in relation to the concept of the study by marking the corresponding cell. Kindly provide your comments and suggestions especially on items with ratings of 2 (SR) and 1 (NR).

1 – Not Relevant (NR) 2 – Somewhat Relevant (SR) 3 – Quite Relevant (QR) 4 – Highly Relevant

Factor A. Content Quality	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
1. Content is consistent with topics/skills found in the DepEd Learning Competencies for the subject and grade/year level it was intended.				/	
2. Concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives.				/	
3. Content is accurate				/	
4. Content is up-to-date				/	
5. Content is logically developed and organized.				/	
6. Content is free from cultural, gender, racial, or ethnic bias				/	
7. Content stimulates and promotes critical thinking.				/	
8. Content is relevant to real-life situations.				/	
9. Language (including vocabulary) is appropriate to the target user level.				/	
10. Content promotes positive values that support formative growth.			/		

Factor B. Instructional Quality					
1. Purpose of the material is well defined.				/	
2. Material achieves its defined purpose.				/	
3. Learning objectives are clearly stated and measurable.				/	
4. Level of difficulty is appropriate for the intended target user.				/	
5. Graphics / colors / sounds are used for appropriate instructional reasons.				/	
6. Material is enjoyable, stimulating, challenging, and engaging.				/	
7. Material effectively stimulates creativity of target user.				/	
8. Feedback on target user's responses is effectively employed.				/	
9. Target user can control the rate and sequence of presentation and review.				/	
10. Instruction is integrated with target user's previous experience.				/	



Factor C. Technical Quality	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
1. Audio/video enhances understanding of the concept.				/	
2. Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood.				/	
3. There is complete synchronization of audio with the visuals, if any.				/	
4. Music and sound effects are appropriate and effective for instructional purposes				/	
5. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing.				/	
6. Visual presentations (non-text) are clear and easy to interpret.				/	
7. Visuals sustain interest and do not distract user's attention.				/	
8. Visuals provide accurate representation of the concept discussed.				/	
9. The user support materials (if any) are effective				/	
10. The design allows the target user to navigate freely through the material.				/	
11. The material can easily and independently be used.				/	
12. The material will run using minimum system requirements.				/	
13. The program is free from technical problems.				/	

Factor D. Usability Characteristics					
D.1 Multimedia Design					
1. Media elements are of sufficiently high quality				/	
2. Clear and precise instructions are provided in accessing multimedia				/	
3. Appropriate forms of media are used to enhance presentation.				/	
4. The multimedia presentations have a coherent layout, design and background.				/	
5. Video is accompanied by a familiar control panel, featuring pause, volume, and slider (to move quickly to a desired part of the video) controls.				/	
6. Audio (other than short sound effects) is accompanied by a familiar control panel, featuring pause, volume, and slider (to move quickly to a desired part of the audio) controls.				/	
7. All images are accompanied by explanatory caption that the user can easily access.				/	



D.1 Multimedia Design	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
8. All spoken sounds are accompanied by detailed textual transcription captions that the user can easily access.				/	

D.2 Overall Interface					
1. The design is visually appealing.				/	
2. The design is simple, i.e. not cluttered, without irrelevant devices and information				/	
3. The design is consistent throughout successive displays.				/	
4. Contains sufficient information and directions for the user to use the resource.				/	
5. The ways to navigate through the material are clear.				/	
6. Labels, buttons, menus, text, and general layout of the resource are consistent and visually distinct				/	
7. Fonts are readable in terms of size, color and contrast between the background and the text				/	
8. The user is always made aware of what to do next.				/	
9. The resource provides feedback about the user's responses				/	

D.3 Behavior of Controls & System Information					
1. The resource responds obviously and appropriately to learners' actions.				/	
2. Icons that can be selected are designed to suggest their intended use.				/	
3. Controls found in many parts of the resource (menus, buttons, and so on) that serve similar functions throughout the resource are placed in similar locations in all displays.				/	
4. Menus, buttons and other familiar controls use the same or similar formats and appearances throughout the resource.				/	
5. A control that can be selected provides dynamic information to the user about the specific function (e.g. the mouse cursor changes appropriately and/or the control changes its visual appearance in some way).				/	
6. A control that has been selected indicates to the user that the selected event has been recognized.				/	



D.4 Customizability/ Support for User Preference	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
1. The user can adjust the magnification of displayed materials.				/	
2. Methods to support navigation are clear and consistent throughout the resource (e.g. arrows, keyboard shortcuts, menus).				/	
3. The user can return to a previous state of the system and repeat from there.				/	
4. All functionality is accessible through mouse or keyboard				/	
5. The user can control the pace at which he/she moves through the material.				/	

D.5 Hyperlinks					
1. Hyperlink text provides information about where the link will lead.				/	
2. Hyperlinks are formatted using acceptable formatting conventions for links (e.g. distinctive underlined font).				/	
3. Hyperlink text is consistently formatted throughout the resource.				/	
4. The cursor or hyperlink text changes appearance to inform the user of the presence of a hyperlink.				/	
5. Hyperlinks that result in the user being directed to material that is external to the current resource are clearly indicated.				/	


JOMAR A. FELIX

Signature over printed name of the validator

10/22/2023

Date



Student's Evaluation Rating Sheet

Direction: In the Student's Evaluation Rating Sheet, learners will assess the extent to which the developed flipbook meets the criteria for Content Quality, Instructional Quality, Technical Quality, and Usability Characteristics using a 4-point Likert scale (4-Very Satisfactory; 3- Satisfactory; 2 – Poor; and 1 – Not Satisfactory).

Please indicate the level of relevance of each criterion in relation to the concept of the study by marking the corresponding cell. Kindly provide your comments and suggestions especially on items with ratings of 2 (SR) and 1 (NR).

1 – Not Relevant (NR) 2 – Somewhat Relevant (SR) 3 – Quite Relevant (QR) 4 – Highly Relevant

Factor A. Content Quality	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
1. The things I learn from this Math flipbook match what I'm supposed to learn in my Math 7, according to the DepEd Learning Competencies. <i>Ang mga bagay na natutunan ko mula sa Math flipbook na ito ay tugma sa mga dapat kong matutunan sa Math 7, ayon sa mga DepEd Learning Competencies</i>				/	
2. The ideas and lessons in this Math flipbook helped me get better at operations with integers and make me feel more confident about what I have learned. <i>Ang mga ideya at mga aral sa Math flipbook na ito ay tumulong sa akin na maging mas mahusay sa mga gawain na may kinalaman sa operations on integers at naging mas tiwala ako sa aking natutunan.</i>				/	
3. I think the information in this Math flipbook is correct and right. <i>Sa palagay ko, ang impormasyon sa Math flipbook na ito ay tama.</i>				/	
4. I feel like the content in this Math flipbook is new and includes the latest information. <i>Bago at naglalaman ng pinakabagong impormasyon ang Math flipbook na ito.</i>				/	
5. The way the content is organized in this Math flipbook makes sense and is easy for me to understand. <i>May kahulugan at madaling maintindihan ang paraan ng pagkakasunud-sunod ng nilalaman sa Math flipbook na ito.</i>				/	
6. Content of this Math flipbook treats everyone equally, no matter their culture, gender, race, or where they come from.				/	



Factor A. Content Quality	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
<i>Nagpapakita ng pantay-pantay na pagtrato sa lahat, kahit ano ang kanilang kultura, kasarian, lahi, o pinanggalingan ang nilalaman ng Math flipbook na ito.</i>					
7. The content in this Math flipbook makes me think and helps me solve problems in a clever way. <i>Nagpapaaisip at tumutulong sa akin na malutas ang mga problema sa isang matalinong paraan ang nilalaman ng Math flipbook.</i>				/	
8. The content in this Math flipbook shows me how math is useful in real-life situations that I can relate to. <i>Nagpapakita sa akin kung paano ang matematika ay kapaki-pakinabang sa tunay na buhay sa sitwasyon na naiintindihan ko ang Math Flipbook.</i>				/	
9. The words and language used in this Math flipbook are just right for someone my age and make it easy for me to learn. <i>Tamang-tama para sa akin at nagpapadali sa aking pagkatuto ang mga salita at lengguwaheng ginamit sa Math flipbook na ito.</i>				/	
10. The content in this Math flipbook teaches me good values and helps me grow as a person. <i>Tinuturuan ako ng magagandang asal at tinutulungan ako ng Math Flipbook na palaguin ang aking sarili.</i>				/	

Factor B. Instructional Quality					
1. The purpose of this material is clear and easy for me to understand. <i>Para sa akin, malinaw at madaling maintindihan ang layunin ng materyal na ito.</i>				/	
2. Math Flipbook does a good job of achieving its intended purpose. <i>Nagagawa ng Math Flipbook nang mahusay ang layunin nito.</i>				/	
3. The things I am supposed to learn from Math Flipbook are explained clearly, and I can tell if I have learned them or not.				/	



Factor B. Instructional Quality	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
<i>Malinaw na naipaliliwanag, at alam ko kung natutuhan ko na o hindi pa ang mga bagay na dapat kong matutunan mula sa Math Flipbook.</i>					
4. The difficulty level of Math Flipbook is just right for someone like me who is using it. <i>Sakto lang ang hirap ng Math Flipbook para sa isang tulad ko.</i>				/	
5. The pictures, colors, and sounds in this Math Flipbook help me understand and learn better. <i>Ang mga larawan, kulay, at tunog sa Math Flipbook na ito ay tumutulong sa akin na mas maintindihan at mas matuto.</i>				/	
6. I enjoy using this Math Flipbook because it is interesting, fun, and makes me think. <i>Nagiging masaya ako sa paggamit ng Math Flipbook dahil ito ay kawili-wili, masaya, at nagpapaipisip sa akin.</i>				/	
7. Math Flipbook helps me be creative and come up with new ideas. <i>Ang materyal na ito ay tumutulong sa akin na maging malikhain at bumuo ng mga bagong ideya.</i>				/	
8. When I answer questions or do activities, I get feedback that helps me understand if I did it right or if I need to try again. <i>Kapag sinasagot ko ang mga tanong o ginagawa ang mga aktibidad, nakakakuha ako ng puna o feedback na tumutulong sa akin na malaman kung tama ang ginawa ko o kung kailangan kong subukan ulit.</i>				/	
9. I can control how fast I go through Math Flipbook and review it as needed. <i>Nakokontrol ko kung gaano kabilis ako mag-aaral sa Math Flipbook at maaring balikan ito kung kinakailangan.</i>				/	
10. This material connects with things I already know and helps me learn new things based on what I already experienced. <i>Nakakonekta sa mga bagay na alam ko na ang Math Flipbook at tumutulong ito sa akin na matuto ng mga bagong bagay batay sa aking mga naranasan na.</i>				/	



Factor C. Technical Quality	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
1. Audio/video enhances understanding of the concept. <i>Nagpapabuti ng aking pagkaunawa sa konsepto ang audio/video.</i>				/	
2. Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood. <i>Malinaw at madaling maunawaan ang pagsasalita at pagkukuwento (tamang bilis, intonasyon, at pagbigkas)</i>				/	
3. There is complete synchronization of audio with the visuals. <i>Ang audio at visual ay nagsasabay</i>				/	
4. Music and sound effects are appropriate and effective for instructional purposes <i>Angkop at epektibo ang Music at sound effects para sa pagkatuto</i>				/	
5. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing. <i>Malinis, madaling basahin, at kaakit-akit sa paningin ang mga salitang display sa screen</i>				/	
6. Visual presentations (non-text) are clear and easy to interpret. <i>Malinaw at madaling maipaliwanag ang mga biswal na presentasyon (tulad ng larawan at video)</i>				/	
7. Math Flipbook's Visuals sustains my interest. <i>Nakakapagpanatili ng aking interes gumagamit ang mga biswal (tulad ng larawan at video) na nasa Math Flipbook</i>				/	
8. Visuals provide accurate representation of the concept discussed. <i>Tamang representasyon ng konseptong pinag-aaralan ang ibinibigay ng mga biswal (tulad ng larawan at video).</i>				/	
9. The user support materials (if any) are effective. <i>Epektibo para sa akin ang mga pangsuportang materyal na ginamit (kung mayroon man)</i>				/	



Factor C. Technical Quality	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
10. The design allows the target user to navigate freely through the Math Flipbook. <i>Ang disenyo ay nagbibigay ng kalayaan sa gumagamit na mag-navigate sa Math Flipbook.</i>				/	Not in 1st person point of view
11. The Math Flipbook can easily and independently be used. <i>Kahit walang tulong ng iba ay madaling gamitin ang Math Flipbook.</i>				/	Not in 1st person point of view
12. Math Flipbook is free from technical problems. <i>Sa aking paggamit ng Math Flipbook ay wala akong problemang teknikal na nakaharap</i>				/	Not in 1st person point of view

Factor D. Usability Characteristics	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
D.1 Multimedia Design					
1. The pictures, videos, and other things I see in this Math flipbook look really good and clear. <i>Maganda at malinaw ang mga larawan, mga video, at iba pang bagay na nakikita ko sa Math flipbook</i>				/	
2. I can easily understand the instructions that tell me how to use the different parts of this Math flipbook with pictures and videos. <i>Madaling maintindihan ang mga instruction na nagtuturo sa akin kung paano gamitin ang iba't ibang bahagi ng Math flipbook na may mga larawan at video.</i>				/	
3. This Math flipbook uses things like pictures and videos in a good way to make learning more fun and interesting. <i>Ginagamit ng Math flipbook nang maayos ang mga bagay tulad ng mga larawan at video upang gawing mas masaya at kawili-wili ang pag-aaral.</i>				/	... and interesting for me.
4. The way this Math flipbook looks, with its layout, design, and background, all make sense and help me understand what I'm learning. <i>Ang pagkakayari ng Math flipbook kasama ang pagkakaayos, disenyo, at background</i>				/	



D.1 Multimedia Design	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
<i>nito ay may kahulugan at tumutulong sa akin na maunawaan ang mga itinuturo.</i>					
5. When there is a video in this Math flipbook, I can use buttons that I recognize to pause it, change the volume, and move to different parts of the video. <i>Kapag may video sa Math flipbook, maaari kong gamitin ang mga pindutan para itigil ito, baguhin ang tunog, at lumipat sa iba't ibang bahagi ng video.</i>				/	
6. If there is sound or music in this Math flipbook, I can use buttons that I know to pause it, change the volume, and move to different parts of the sound or music. <i>Kung may tunog o musika sa Math flipbook, maaari kong gamitin ang mga pindutan para itigil ito, baguhin ang tunog, at lumipat sa iba't ibang bahagi ng tunog o musika.</i>				/	
7. Every picture in this Math flipbook has words that explain what's happening, and I can easily read them to understand better. <i>Bawat larawan sa Math flipbook ay may mga paliwanag kung ano ang nangyayari, at madali kong mabasa ko ang mga ito upang mas maunawaan.</i>				/	
8. When there are sounds or voices in this Math flipbook, there are words on the screen that show me exactly what is being said, and I can easily read them. <i>Kapag may mga tunog o mga boses sa Math flipbook, may mga salita sa screen na nagpapakita sa akin ng eksaktong sinasabi, at Madali kong mabasa ang mga ito.</i>				/	

D.2 Overall Interface					
1. The design of this Math flipbook looks really nice and attractive. <i>Napakaganda at kaaya-aya sa paningin ang disenyo ng Math flipbook na ito.</i>				/	... and attractive to me.
2. The design of this Math flipbook is simple and not crowded, with only the important things and no unnecessary information. <i>Simple at hindi masyadong siksikan ang disenyo ng Math Flipbook, Mahahalagang impormasyon lamang ang nilalaman.</i>				/	Not in 1st person point of view



D.2 Overall Interface	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
3. The design of this Math flipbook has a theme that looks consistent as I go through different parts of it. <i>Mayroong theme ang disenyo ng Math Flipbook na nananatili sa lahat ng bahagi ng buong module na ito.</i>				/	
4. This Math flipbook has enough information and instructions for me to understand how to use it. <i>May sapat na impormasyon at mga instruction ang Math flipbook upang maunawaan ko kung paano ito gamitin.</i>				/	
5. It's easy for me to find my way around and move through this Math flipbook. <i>Madali sa akin ang magpalipat-lipat sa nilalaman ng Math flipbook</i>				/	
6. The buttons, menus, text, and overall layout of this Math flipbook are always the same and look different from each other, so I can easily recognize them. <i>Ang mga pindutan, menu, salita, at kabuuang disenyo ng Math flipbook na ito ay palaging pareho at magkakaiba ang hitsura, kaya madali kong makikilala ang mga ito.</i>				/	
7. The words in this Math flipbook are easy to read because the font size, color, and the contrast with the background are just right. <i>Madaling basahin ang mga salita sa Math flipbook na ito dahil tamang-tama ang laki ng letra, kulay, at tugma sa background</i>				/	Not in 1st person point of view
8. I always know what I need to do next because this Math flipbook tells me. <i>Palagi kong alam kung ano ang susunod kong gagawin dahil sinasabi ito ng Math flipbook.</i>				/	
9. This Math flipbook gives me feedback to let me know if I did things right or if I need to try again. <i>Math flipbook na ito ay nagbibigay sa akin ng tulong at puna o feedback para malaman ko kung tama ang ginawa ko o kung kailangan kong subukan ulit.</i>				/	



D.3 Behavior of Controls & System Information	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
1. This Math flipbook does what I expect it to do when I interact with it using the buttons available. <i>Ginagawa ng Math Flipbook ang inaasahan ko kapag ako ay may pinagawa rito gamit ang mga pindutang makikita rito.</i>				/	
2. The pictures or symbols I can choose in this Math flipbook show me what they are for and make it easy to understand. <i>Madali kong nauunawaan ang mga larawan at simbolo sa Math Flipbook dahil nakalagay rito kung para saan ang mga ito.</i>				/	
3. The buttons, menus, and other things I can click on in different parts of this Math flipbook are always in the same places, so I can find them easily. <i>Ang mga pindutan, menu, at iba pang mga bagay na maaaring pindutin ko sa iba't ibang bahagi ng Math flipbook na ito ay palaging nasa parehong mga lugar, kaya madali kong makikita ang mga ito.</i>				/	
4. The buttons, menus, and other things I can click on in this Math flipbook look the same or similar. <i>Ang mga pindutan, menu, at iba pang mga bagay na maaaring pindutin ko sa Math flipbook na ito ay magkakatulad o magkamukha.</i>				/	
5. When I can select a button or control in this Math flipbook, it gives me information about what it does by changing the way it looks or by showing me something new. <i>Kapag pinili ko ang pindutan o kontrol sa Math flipbook na ito, binibigyan ako ng impormasyon tungkol sa kung ano ang nagagawa nito sa pamamagitan ng pagbabago ng hitsura o pagpapakita ng bagong impormasyon.</i>				/	
6. When I click on interactive icon, I can see that it knows I clicked on it because it changes or shows something different. <i>Kapag pinindot ko ang mga interactive icon, nagbabago ito o nagpapakita ng ibang bagay.</i>				/	



D.4 Customizability/ Support for User Preference	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
1. I can make the things I see in this Math flipbook bigger or smaller to see them better. <i>Maaari kong gawing mas malaki o mas maliit ang mga bagay na nakikita ko sa Math flipbook upang mas maayos ko silang makita.</i>				/	
2. I can move around and find things easily in this Math flipbook because there are clear and consistent ways to navigate, like using arrows, keyboard shortcuts, or menus. <i>Mayroong malinaw at pare-parehong paraan ng pag-navigate sa Math Flipbook, Kaya madali kong nagagalaw at nahahanap ang mga bagay tulad ng mga arrow, shortcut sa keyboard, o mga menu.</i>				/	
3. If I want to go back to something I did before in this Math flipbook, I can do that and start from there again. <i>Kung gusto kong bumalik sa isang bagay na ginawa ko noon sa Math flipbook na ito, maaari kong gawin iyon at magsimula muli mula doon.</i>				/	
4. I can do everything in this Math flipbook using either the mouse or the keyboard. <i>Maaari kong gawin ang lahat ng bagay sa Math flipbook na ito gamit ang mouse o keyboard.</i>				/	
5. I can choose how fast or slow I want to go through the Math flipbook. <i>Maaari kong piliin kung gaano kabilis o kabagal ko gustong magpatuloy sa Math flipbook.</i>				/	

D.5 Hyperlinks					
1. The words that are clickable and take me to another place have information that tells me where they will take me. <i>Ang mga salitang maaaring pindutin at nagdadala sa akin sa ibang lugar ay may impormasyon na nagsasabi kung saan nila ako dadalhin.</i>				/	
2. The clickable words are underlined and look different from the other text, which helps me know that they are links.				/	



D.5 Hyperlinks	1 (NR)	2 (SR)	3 (QR)	4 (HR)	Remarks
<i>Ang mga salitang maaaring pindutin ay may salung-guhit at ibang hitsura mula sa ibang salita, na tumutulong sa akin na malaman na mga ito ay mga link.</i>					
3. The words that are links look the same all the time in all parts of this Math flipbook. <i>Ang mga salitang mga link ay palaging magkapareho ang hitsura sa lahat ng bahagi ng Math flipbook</i>				/	
4. When I move my mouse over a link or click on it, the mouse cursor or the appearance of the words change to show me that it's a link. <i>Kapag inilipat ko ang aking mouse sa isang link o pinindot ito, ang cursor ng mouse o hitsura ng mga salita ay nagbabago upang ipakita sa akin na ito ay isang link.</i>				/	
5. If a link takes me to something outside of this Math flipbook, it is clearly shown or indicated to me. <i>Kung ang isang link ay dadalhin ako sa isang bagay na nasa labas ng Math flipbook, ito ay malinaw na ipinapakita o ipinapahiwatig sa akin.</i>				/	

JOMAR A. FELIX
Signature over printed name of the validator

10/22/2023
Date



Ratings on the Instrument by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Expert's Questionnaire

Ratings on Flipbook's Theme by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Flipbook's Theme	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Adventure	x	x	x	3	1.00
Animals	x	x	x	3	1.00
Anime/comics/cartoons	x	x	x	3	1.00
Art	x	x	x	3	1.00
Fantasy	x	x	x	3	1.00
Fashion	x	x	x	3	1.00
Food	x	x	x	3	1.00
Game Show	x	x	x	3	1.00
Horror	x	x	x	3	1.00
Movie/book	x	x	x	3	1.00
Music	x	x	x	3	1.00
Nature	x	x	x	3	1.00
Online Games	x	x	x	3	1.00
Pirates	x	x	x	3	1.00
Sports	x	x	x	3	1.00
Proportion				S-CVI/Ave= 1.00	
Relevant:	1	1	1	S-CVI/UA=1.00	
				Mean expert proportion=1.00	

Ratings on Content Quality by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor A	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Content Quality Items					
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00
Item 10	x	x	x	3	1.00
Proportion				S-CVI/Ave= 1.00	
Relevant:	1	1	1	S-CVI/UA=1.00	
				Mean expert proportion=1.00	

Ratings on Instructional Quality by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor B Instructional Quality Items	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00
Item 10	x	x	x	3	1.00
Proportion				S-CVI/Ave= 1.00	
Relevant:	1	1	1	S-CVI/UA=1.00	
				Mean expert proportion=1.00	

Ratings on Technical Quality by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor C Technical Quality Items	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00
Item 10	x	x	x	3	1.00
Item 11	x	x	x	3	1.00
Item 12	x	x	x	3	1.00
Item 13	x	x	x	3	1.00

Proportion Relevant:	1	1	1	S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00
----------------------	---	---	---	---

Ratings on Usability Characteristics: Multimedia Design by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.1 Usability Characteristics: Multimedia Design	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00
Proportion Relevant:				S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	
	1	1	1		



Ratings on Usability Characteristics: Overall Interface by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.1					
Usability	Expert	Expert	Expert	Number of	Item CVI
Characteristics:	1	2	3	Agreement	
Overall Interface					
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00
Proportion Relevant:				S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	
	1	1	1		

Ratings on Usability Characteristics: Behavior of Controls & System Information by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.3					
Usability	Expert	Expert	Expert	Number of	Item CVI
Characteristics:	1	2	3	Agreement	
Behavior of Controls & System Information					
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Proportion Relevant:				S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	
	1	1	1		



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

Ratings on Usability Characteristics: Customizability/ Support for User Preference by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.4					
Usability					
Characteristics:	Expert	Expert	Expert	Number of	Item CVI
Customizability/	1	2	3	Agreement	
Support for User					
Preference					
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Proportion				S-CVI/Ave= 1.00	
Relevant:	1	1	1	S-CVI/UA=1.00	
				Mean expert	
				proportion=1.00	

Ratings on Usability Characteristics: Hyperlink by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.5					
Usability					
Characteristics:	Expert	Expert	Expert	Number of	Item CVI
Hyperlink	1	2	3	Agreement	
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Proportion				S-CVI/Ave= 1.00	
Relevant:	1	1	1	S-CVI/UA=1.00	
				Mean expert	
				proportion=1.00	



Student's Questionnaire

Ratings on Content Quality by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor A Content Quality Items	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00
Item 10	x	x	x	3	1.00
Proportion Relevant:	1	1	1	S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	

Ratings on Instructional Quality by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor B Instructional Quality Items	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00
Item 10	x	x	x	3	1.00
Proportion Relevant:	1	1	1	S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	



Ratings on Technical Quality by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor C Technical Quality Items	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00
Item 10	x	x	x	3	1.00
Item 11	x	x	x	3	1.00
Item 12	x	x	x	3	1.00
Item 13	x	x	x	3	1.00
Proportion Relevant:	1	1	1	S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	

Ratings on Usability Characteristics: Multimedia Design by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.1 Usability Characteristics: Multimedia Design	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00



Proportion Relevant:	1	1	1	S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00
----------------------	---	---	---	---

Ratings on Usability Characteristics: Overall Interface by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.1 Usability Characteristics: Overall Interface	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
Item 1	x	x	x	3	1.00
Item 2	x	x	x	3	1.00
Item 3	x	x	x	3	1.00
Item 4	x	x	x	3	1.00
Item 5	x	x	x	3	1.00
Item 6	x	x	x	3	1.00
Item 7	x	x	x	3	1.00
Item 8	x	x	x	3	1.00
Item 9	x	x	x	3	1.00
Proportion Relevant:	1	1	1	S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	

Ratings on Usability Characteristics: Behavior of Controls & System Information by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.3 Usability Characteristics: Behavior of Controls & System Information	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
1.	x	x	x	3	1.00
2.	x	x	x	3	1.00
3.	x	x	x	3	1.00
4.	x	x	x	3	1.00
5.	x	x	x	3	1.00



6.	x	x	x	3	1.00
7.	x	x	x	3	1.00
Proportion Relevant:	1	1	1	S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	

Ratings on Usability Characteristics: Customizability/ Support for User Preference by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.4 Usability Characteristics: Customizability/ Support for User Preference	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
1.	x	x	x	3	1.00
2.	x	x	x	3	1.00
3.	x	x	x	3	1.00
4.	x	x	x	3	1.00
5.	x	x	x	3	1.00
Proportion Relevant:	1	1	1	S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	

Ratings on Usability Characteristics: Hyperlink by Three Experts: Items Rated 3 or 4 on a 4-Point Relevance Scale

Factor D.5 Usability Characteristics: Hyperlink	Expert 1	Expert 2	Expert 3	Number of Agreement	Item CVI
1.	x	x	x	3	1.00
2.	x	x	x	3	1.00



3.	x	x	x	3	1.00
4.	x	x	x	3	1.00
5.	x	x	x	3	1.00
Proportion Relevant:	1	1	1	S-CVI/Ave= 1.00 S-CVI/UA=1.00 Mean expert proportion=1.00	



Sample Students' Module's Theme Preference Survey Form

PHILIPPINE NORMAL UNIVERSITY – NORTH LUZON
The National Center for Teacher Education
The Indigenous Peoples Education Hub
North Luzon
Alicia, Isabela

Title: **CATCH-UP MATERIAL IN OPERATIONS ON INTEGERS USING FLIPBOOK THROUGH AGILE MODEL**

Researcher: **Rochelle Kaye I. Villena**
Adviser: **Dr. Roldan S. Cardona**

Dear respondent,

This survey will be used for the purpose of gathering data to improve your performance in Operations on Integers using flipbook through Agile Model. All the results will be confidential and solely for research.

Ang talatanungan na ito ay may layuning mangolekta ng datos upang mapayahong pa ang iyong kaalaman sa Operations on Integers sa pamamagitan ng flipbook gamit ang Agile model. Lahat ng resulta ay ituturing na kompidensyal at para lamang sa pananaliksik.

Part I. Respondent's Profile

Name(Optional): Mark Louise Sumaylo Age: 13 Gender: m
School: MLQ NHS Section: Sapphire

Part II. Students' Flipbook's Theme Preference

Instruction: For each flipbook's theme listed below, please rate your level of interest if a module on operations on integers is to be created using the scale provided by putting a check(✓) on the appropriate box: (Sa bawat tema ng module na nakalista sa ibaba, maaaring magbigay ka ng iyong antas ng interes gamit ang ibinigay na sukat sa pamamagitan ng paglalagay ng tsek (✓) sa kahon:)

- | | |
|-------------------------|-----------------------------|
| 1- Not Interested | 1- Hindi Interesado |
| 2 - Slightly Interested | 2 – Bahagyang Interesado |
| 3- Interested | 3- Interesado |
| 4 - Very Interested | 4 – Interesadong-Interesado |

Flipbook's Theme with Short Description	Level of Interest			
	1	2	3	4
Adventure: Embark on an adventure where you encounter integer-based challenges and puzzles. Use your understanding of operations on integers to solve problems and progress through the adventure, reinforcing your knowledge and skills. <i>Sumalang sa isang pakikipagsapalaran kung saan makakaranas ka ng mga hamon at palatsipan batay sa Operations on Integers. Gamitin ang iyong pang-unawa sa Operations on Integers upang malutas ang mga suliranin at magpatuloy sa iyong pakikipagsapalaran, na nagpapatibay ng iyong kaalaman at kasanayan.</i>				✓



Flipbook's Theme with Short Description	Level of Interest			
	1	2	3	4
Animals: Explore integer operations through animal-related scenarios and design. Calculate the number of animals in a given population, analyze data on animal behavior or habitat sizes using integers, or solve word problems involving animal. <i>Tuklasin ang Operations on Integers sa pamamagitan ng mga senaryo at disenyo na may kaugnayan sa mga hayop. Tanyahin ang bilang ng mga hayop, suriin ang mga datos tungkol sa mga hayop o sa kanilang tirahan gamit ang mga integer, o lumutas ng mga problema na may kinalaman sa mga hayop.</i>			✓	
Anime/comics/cartoons: Immerse yourself in anime/comics/cartoons-inspired scenarios and design, and apply integer operations. Calculate power levels, analyze character statistics, or solve integer-based puzzles within the context of anime/manga storylines. <i>Pag-aralan ang Operations on Integers sa pamamagitan ng mga pangyayari at disenyo na nakabatay sa anime/manga/cartoons. Lumutas ng mga problemang nilalapatan ng kaalaman sa Operations on Integers sa konteksto ng mga kuwento ng mga ito.</i>				✓
Art: Engage in art-related activities that incorporate integer operations. Create art using integers, design geometric patterns with integer dimensions, or apply integer-based calculations for solving art-related word problems. <i>Aralin ang Operations on Integers sa pamamagitan ng mga aktibidad na may kaugnayan sa sining (arts). Lumikha ng sining gamit ang mga integer, magdisenyo ng mga patterns gamit ang integers, o lumutas ng mga palaisipang may kinalaman sa sining at Operations on Integers</i>		✓		
Fantasy: Within a fantasy-themed context, apply integer operations to solve magical puzzles, calculate potion ingredients using integers, or determine the impact of integer-based magical spells on characters or the environment. <i>Lumutas ng mga problema gamit ang operations on integers sa loob ng isang kathang-isip na mundo. Mayroon ditong mahiwagang palaisipan, pagakalkula ng mga sangkap ng potion gamit ang integer, o pagtukoy ng epekto ng mga mahiwagang spells sa mga tauhan o kapaligiran na nakabatay sa mga integer.</i>			✓	
Fashion: Use integer operations in fashion-related contexts and design. Determine fabric measurements using integers, calculate discounts or sales prices, or analyze integer-based fashion trends and patterns. <i>Gamitin operations on integers sa mga konteksto at disenyo na may kaugnayan sa fashion. Matukoy ang mga sukat ng tela gamit ang integer, kalkulahin ang presyo ng mga produkto na naka-sale, o suriin ang mga trend at pattern sa fashion na nakabatay sa mga integer.</i>			✓	



Flipbook's Theme with Short Description	Level of Interest			
	1	2	3	4
Food: Incorporate integer operations into cooking and culinary scenarios and design. Adjust recipe quantities using integers, calculate cooking times or temperatures, or analyze integer-based nutrition facts and portion sizes. <i>Iugnay ang operations on integer sa mga pangyayari at disenyo na may kinalaman sa pagluluto at kusina. Ayusin ang dami ng sangkap sa mga resipe gamit ang integer, kalkulahin ang oras o temperatura ng pagluluto, o suriin ang mga nutrition facts at portion sizes na nakabatay sa mga integer.</i>				✓
Game Show: Participate in game show-inspired activities that involve integer operations. Solve integer-based puzzles, answer integer-related trivia questions, or compete in integer-based challenges. <i>Sumali sa mga gawain na base sa mga game show na naglalaman ng operation on integers. Lumutas ng mga palaisipan na nakabatay sa mga integer, sagutin ang mga trivia na tanong na may kaugnayan sa mga integer.</i>			✓	
Horror: Encounter integer-based puzzles or challenges within a horror-themed setting. Solve integer-related codes, unlock doors, or calculate time-based scenarios within the horror storyline. <i>Harapin ang mga palaisipan na nakabatay sa mga integer sa isang horror. Alamin ang mga code na may kaugnayan sa mga integer, buksan ang mga pinto, o lutasin ang mga problema na may kaugnayan sa oras sa loob ng kuwentong horror.</i>			✓	
Movie/book: Analyze integer-related scenarios or problems within movies or books. Calculate distances or time intervals in movie/book settings, solve word problems based on movie/book plots, or analyze integer-related data from movie/book characters. <i>Suriin ang mga pangyayari o problema sa mga pelikula o aklat na may kinalaman sa mga integer. Tantiyahin ang mga distansya o mga pagitan ng oras sa mga setting ng pelikula/aklat, lumutas ng mga problema na batay sa mga kuwento ng pelikula/aklat, o suriin ang mga datos na may kaugnayan sa mga integer mula sa mga karakter ng pelikula/aklat.</i>				✓
Music: Incorporate integer operations into music-themed activities. Analyze musical intervals using integers, calculate rhythm durations, or explore integer-based musical patterns and sequences. <i>Isama ang operation on integers sa mga gawain na may temang musika. Sumuri ng musical intervals gamit ang integer, kalkulahin ang rhythm durations, o tuklasin ang mga integer-based musical patterns and sequences.</i>			✓	



Flipbook's Theme with Short Description	Level of Interest			
	1	2	3	4
Nature: Apply integer operations to understand natural phenomena. Analyze integer-related data on animal populations, calculate temperature variations, or solve word problems related to natural events using integer operations. <i>Gamitin ang operations on integers upang maunawaan ang mga natural phenomena. Suriin ang mga datos na may kaugnayan sa mga integer tungkol sa populasyon ng mga hayop, kalkulahin ang pagbabago ng temperatura, o malutas ang mga problema na may kinalaman sa mga natural na pangyayari gamit ang operations on integers.</i>			✓	
Online Games: Infuse integer operations into interactive online gaming scenarios. Dive into the world of online gaming and learn integer operations while solving in-game puzzles, strategizing with integers, and exploring math challenges within your favorite online games. <i>Ipasok ang operations on integers sa mga interaktibong online gaming na senaryo. Makilahok sa mundo ng online gaming at matuto ng operations on integers habang lumulutas ng mga puzzle sa loob ng laro, gumagawa ng mga estratehiya gamit ang mga integer, at nagsasaliksik ng mga math challenges sa loob ng iyong mga paboritong online games.</i>			✓	
Pirates: Within a pirate-themed context, face integer-related challenges. Calculate treasure distributions among pirate crews, analyze integer-based map coordinates, or solve word problems involving pirate scenarios and integer operations. <i>Sa loob ng isang konteksto na may temang pirata, harapin mo ang mga hamon na may kinalaman sa mga integer. Kalkulahin ang pamamahagi ng kayamanan sa mga myembro ng mga pirata, suriin ang mga coordinates sa mapa na nakabatay sa mga integer, o lumutas ng mga problema na may kinalaman sa pakikipagsapalaran ng mga pirata.</i>			✓	
Sports: Integrate integer operations into sports-themed activities and design. Analyze sports statistics using integers, calculate scores or rankings, or solve integer-based problems related to sports performance and records. <i>Isama ang operations on integers sa mga gawain at disenyo na may temang palakasan. Suriin ang sports statistics sa palakasan gamit ang integer, kalkulahin ang mga puntos o ranggo, o lutasin ang mga problema na nakabatay sa mga integer na may kaugnayan sa palakasan.</i>				✓

If there is a module theme that you would like to suggest, which is not included in the provided list, please write it in the space provided below:

(Kung mayroon kang ibang nais na tema ng module na hindi kasama sa ibinigay na listahan, mangyaring isulat ito sa espasyong ibinigay sa ibaba:)

Wala na po. Andito na yung mga gusto ko

Signature of the student

Date



PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

Sample Evaluator's Rating Sheet

PHILIPPINE NORMAL UNIVERSITY – NORTH LUZON

The National Center for Teacher Education

The Indigenous Peoples Education Hub

North Luzon

Alicia, Isabela

Title: **CATCH-UP MATERIAL IN OPERATIONS ON INTEGERS USING FLIPBOOK THROUGH AGILE MODEL**

Researcher: **Rochelle Kaye I. Villena**

Adviser: **Dr. Roldan S. Cardona**

This survey will be used for the purpose of gathering data to improve the student's performance in Operations on Integers using flipbook through Agile Model. All the results will be confidential and solely for research.

Part I. Subject Matter Expert's Profile

Name (optional): Junar P. Santiago Sex: Male Age: 39

Position: Master Teacher 2 No. of year in service: 14

Institution: Alicia NHS

Highest Educ. Attainment: College / Masteral / Doctoral

No. of trainings attended on Module Development/Interactive Material: _____

(Please write the title of the seminars on the space provided below, if there is any):

None

Part II. Expert's Evaluation

Instruction: Examine the material carefully and for each evaluation criterion consider the extent to which the developed flipbook meets the criteria for Content Quality, Instructional Quality, Technical Quality, and Usability Characteristics. Check the appropriate number [with 4 being Very Satisfactory (VS); 3- Satisfactory (S); 2 – Poor (P); and 1 – Not Satisfactory (NS)]. For a rating below 4, kindly write your comments/justifications on each evaluation criterion to improve the flipbook.

Factor A. Content Quality	1 NS	2 P	3 S	4 VS	Comments
1. Content is consistent with topics/skills found in the DepEd Learning Competencies for the subject and grade/year level it was intended.				/	
2. Concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives.				/	
3. Content is accurate				/	
4. Content is up-to-date				/	



Factor A. Content Quality	1 NS	2 P	3 S	4 VS	Comments
5. Content is logically developed and organized.				/	
6. Content is free from cultural, gender, racial, or ethnic bias				/	
7. Content stimulates and promotes critical thinking.				/	
8. Content is relevant to real-life situations.			/		
9. Language (including vocabulary) is appropriate to the target user level.				/	
10. Content promotes positive values that support formative growth.				/	

Factor B. Instructional Quality	1 NS	2 P	3 S	4 VS	Comments
1. Purpose of the material is well defined.				/	
2. Material achieves its defined purpose.				/	
3. Learning objectives are clearly stated and measurable.				/	
4. Level of difficulty is appropriate for the intended target user.				/	
5. Graphics / colors / sounds are used for appropriate instructional reasons.				/	
6. Material is enjoyable, stimulating, challenging, and engaging.				/	
7. Material effectively stimulates creativity of target user.				/	
8. Feedback on target user's responses is effectively employed.				/	
9. Target user can control the rate and sequence of presentation and review.				/	
10. Instruction is integrated with target user's previous experience.				/	

Factor C. Technical Quality	1 NS	2 P	3 S	4 VS	Comments
1. Audio/video enhances understanding of the concept.				/	
2. Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood.				/	



Factor C. Technical Quality	1 NS	2 P	3 S	4 VS	Comments
3. There is complete synchronization of audio with the visuals, if any.				/	
4. Music and sound effects are appropriate and effective for instructional purposes				/	
5. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing.			/		Some texts are not visible or readable
6. Visual presentations (non-text) are clear and easy to interpret.				/	
7. Visuals sustain interest and do not distract user's attention.				/	
8. Visuals provide accurate representation of the concept discussed.				/	
9. The user support materials (if any) are effective				/	
10. The design allows the target user to navigate freely through the material.			/		If you can add icon/s that are blinking in the video it would be better.
11. The material can easily and independently be used.				/	
12. The material will run using minimum system requirements.				/	
13. The program is free from technical problems.				/	

Factor D. Usability Characteristics	1 NS	2 P	3 S	4 VS	Comments
D.1 Multimedia Design					
1. Media elements are of sufficiently high quality			/		The teacher in the videos is not vivid.
2. Clear and precise instructions are provided in accessing multimedia				/	
3. Appropriate forms of media are used to enhance presentation.				/	
4. The multimedia presentations have a coherent layout, design and background.				/	
5. Video is accompanied by a familiar control panel, featuring pause, volume, and slider (to move quickly to a desired part of the video) controls.				/	
6. Audio (other than short sound effects) is accompanied by a familiar control panel, featuring pause, volume, and slider (to				/	



D.1 Multimedia Design	1 NS	2 P	3 S	4 VS	Comments
move quickly to a desired part of the audio) controls.				/	
7. Images are accompanied by explanatory caption that the user can easily access.				/	
8. All spoken sounds are accompanied by detailed textual transcription captions that the user can easily access.				/	

D.2 Overall Interface	1 NS	2 P	3 S	4 VS	Comments
1. The design is visually appealing.				/	
2. The design is simple, i.e. not cluttered, without irrelevant devices and information				/	
3. The design is consistent throughout successive displays.				/	
4. Contains sufficient information and directions for the user to use the resource.				/	
5. The ways to navigate through the material are clear.				/	
6. Labels, buttons, menus, text, and general layout of the resource are consistent and visually distinct				/	
7. Fonts are readable in terms of size, color and contrast between the background and the text			/		There are few texts that are not readable
8. The user is always made aware of what to do next.				/	
9. The resource provides feedback about the user's responses				/	

D.3 Behavior of Controls & System Information	1 NS	2 P	3 S	4 VS	Comments
1. The resource responds obviously and appropriately to learners' actions.			/		Add audio when the learners click the icons if possible.
2. Icons that can be selected are designed to suggest their intended use.				/	
3. Controls found in many parts of the resource (menus, buttons, and so on) that serve similar functions throughout the resource are placed in similar locations in displays.				/	



D.3 Behavior of Controls & System Information	1 NS	2 P	3 S	4 VS	Comments
4. Menus, buttons and other familiar controls use the same or similar formats and appearances throughout the resource.				/	
5. A control that can be selected provides dynamic information to the user about the specific function (e.g. the mouse cursor changes appropriately and/or the control changes its visual appearance in some way).				/	
6. A control that has been selected indicates to the user that the selected event has been recognized.				/	

D.4 Customizability/ Support for User Preference	1 NS	2 P	3 S	4 VS	Comments
1. The user can adjust the magnification of displayed materials.				/	
2. Methods to support navigation are clear and consistent throughout the resource (e.g. arrows, menus, buttons).				/	
3. The user can return to a previous state of the system and repeat from there.				/	
4. All functionality is accessible through mouse or keyboard				/	
5. The user can control the pace at which he/she moves through the material.				/	

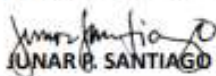
D.5 Hyperlinks	1 NS	2 P	3 S	4 VS	Comments
1. Hyperlink provides information about where the link will lead.				/	
2. Hyperlinks text (if there is any) are formatted using acceptable formatting conventions for links (e.g. distinctive underlined font).				/	
3. Hyperlink text (if there is any) is consistently formatted throughout the resource.				/	
4. The cursor or hyperlink changes appearance to inform				/	



the user of the presence of a hyperlink.					
5. Hyperlinks that result in the user being directed to material that is external to the current resource are clearly indicated.				/	

Comments/Suggestion:

Congratulations for coming up with an appropriate and scholarly done learning resource for the mathematics learners! I do appreciate the materials. For me it would help and enrich the learning of learners. I hope to see or encounter similar materials that you developed as mathematics teacher.


JUNAR B. SANTIAGO

Date: _____

Evaluator's signature over printed name



Sample Student's Rating Sheet

PHILIPPINE NORMAL UNIVERSITY – NORTH LUZON
The National Center for Teacher Education
The Indigenous Peoples Education Hub
North Luzon
Alicia, Isabela

Title: **CATCH-UP MATERIAL IN OPERATIONS ON INTEGERS USING FLIPBOOK THROUGH AGILE MODEL**

Researcher: **Rochelle Kaye I. Villena**
Adviser: **Dr. Roldan S. Cardona**

Dear respondent,

This survey will be used for the purpose of gathering data to improve your performance in Operations on Integers using flipbook through Agile Model. All the results will be confidential and solely for research.

Ang talatanungan na ito ay may layuning mangolekta ng datos upang mapayabong pa ang iyong kaalaman sa Operations on Integers sa pamamagitan ng flipbook gamit ang Agile model. Lahat ng resulta ay ituturing na kompidensyal at para lamang sa pananaliksik.

Part I. Respondent's Profile

Name(Optional): Albrenz Tagalicud Age: 13 Gender: Male
School: Cebu Integrated School Section: 7 - CourtKow

Part II. Student's Evaluation

Instruction: Examine the material carefully and for each evaluation criterion consider the extent to which the developed flipbook meets the criteria for Content Quality, Instructional Quality, Technical Quality, and Usability Characteristics. Check the appropriate number [with 4 being Very Satisfactory (VS); 3- Satisfactory (S); 2 – Poor (P); and 1 – Not Satisfactory (NS)]. *(Surin nang maingat ang mga pamantayan at i-rate ang Math Flipbook base sa Content Quality, Instructional Quality, Technical Quality, and Usability Characteristics. I-tsek ang numero na nararapat)*

Factor A. Content Quality	1 (NS)	2 (P)	3 (S)	4 (VS)
1. The things I learn from this Math flipbook match what I'm supposed to learn in my Math 7, according to the DepEd Learning Competencies. <i>Ang mga bagay na natutunan ko mula sa Math flipbook na ito ay tugma sa mga dapat kong matutunan sa Math 7, ayon sa mga DepEd Learning Competencies</i>				/
2. The ideas and lessons in this Math flipbook helped me get better at operations with integers and make me feel more confident about what I have learned. <i>Ang mga ideya at mga aral sa Math flipbook na ito ay tumulong sa akin na maging mas mahusay sa mga gawain na may kinalaman sa operations on integers at naging mas tiwala ako sa aking natutunan.</i>				/



Factor A. Content Quality	1 (NS)	2 (P)	3 (S)	4 (VS)
3. think the information in this Math flipbook is correct and right. <i>Sa palagay ko, ang impormasyon sa Math flipbook na ito ay tama.</i>				/
4. I feel like the content in this Math flipbook is new and includes the latest information. <i>Bago at naglalaman ng pinakabagong impormasyon ang Math flipbook na ito.</i>				/
5. The way the content is organized in this Math flipbook makes sense and is easy for me to understand. <i>May kahulugan at madaling maintindihan ang paraan ng pagkakasunud-sunod ng nilalaman sa Math flipbook na ito.</i>				/
6. Content of this Math flipbook treats everyone equally, no matter their culture, gender, race, or where they come from. <i>Nagpapakita ng pantay-pantay na pagtrato sa lahat, kahit ano ang kanilang kultura, kasarian, lahi, o pinanggalingan ang nilalaman ng Math flipbook na ito.</i>				/
7. The content in this Math flipbook makes me think and helps me solve problems in a clever way. <i>Nagpapaipisip at tumutulong sa akin na malutas ang mga problema sa isang matalinong paraan ang nilalaman ng Math flipbook.</i>				/
8. The content in this Math flipbook shows me how math is useful in real-life situations that I can relate to. <i>Nagpapakita sa akin kung paano ang matematika ay kapaki-pakinabang sa tunay na buhay sa sitwasyon na natintindihan ko ang Math Flipbook.</i>				/
9. The words and language used in this Math flipbook are just right for someone my age and make it easy for me to learn. <i>Tamang-tama para sa akin at nagpapadali sa aking pagkatuto ang mga salita at lengguwaheng ginamit sa Math flipbook na ito.</i>				/
10. The content in this Math flipbook teaches me good values and helps me grow as a person. <i>Tinuturuan ako ng magagandang asal at tinutulungan ako ng Math Flipbook na palaguin ang aking sarili.</i>				/

Factor B. Instructional Quality	1 (NS)	2 (P)	3 (S)	4 (VS)
1. The purpose of this material is clear and easy for me to understand. <i>Para sa akin, malinaw at madaling maintindihan ang layunin ng materyal na ito.</i>				/
2. Math Flipbook does a good job of achieving its intended purpose. <i>Nagagawa ng Math Flipbook nang mahusay ang layunin nito.</i>				/
3. The things I am supposed to learn from Math Flipbook are explained clearly, and I can tell if I have learned them or not. <i>Malinaw na naipaliwanag, at alam ko kung natutuhan ko na o hindi pa ang mga bagay na dapat kong matutunan mula sa Math Flipbook.</i>				/



Factor B. Instructional Quality	1 (NS)	2 (P)	3 (S)	4 (VS)
4. The difficulty level of Math Flipbook is just right for someone like me who is using it. <i>Sakto lang ang hirap ng Math Flipbook para sa isang tulad ko.</i>				/
5. The pictures, colors, and sounds in this Math Flipbook help me understand and learn better. <i>Ang mga larawan, kulay, at tunog sa Math Flipbook na ito ay tumutulong sa akin na mas maintindihan at mas matuto.</i>				/
6. I enjoy using this Math Flipbook because it is interesting, fun, and makes me think. <i>Nagiging masaya ako sa paggamit ng Math Flipbook dahil ito ay kawili-wili, masaya, at nagpapaalis sa akin.</i>				/
7. Math Flipbook helps me be creative and come up with new ideas. <i>Ang materyal na ito ay tumutulong sa akin na maging malikhain at bumuo ng mga bagong ideya.</i>				/
8. When I answer questions or do activities, I get feedback that helps me understand if I did it right or if I need to try again. <i>Kapag sinasagot ko ang mga tanong o ginagawa ang mga aktibidad, nakakakuha ako ng puna o feedback na tumutulong sa akin na malaman kung tama ang ginawa ko o kung kailangan kong subukan ulit.</i>				/
9. I can control how fast I go through Math Flipbook and review it as needed. <i>Nakokontrol ko kung gaano kabilis ako mag-aaral sa Math Flipbook at maaring balikan ito kung kinakailangan.</i>				/
10. This material connects with things I already know and helps me learn new things based on what I already experienced. <i>Nakakonekta sa mga bagay na alam ko na ang Math Flipbook at tumutulong ito sa akin na matuto ng mga bagong bagay batay sa aking mga naranasan na.</i>				/

Factor C. Technical Quality	1 (NS)	2 (P)	3 (S)	4 (VS)
1. Audio/video enhances understanding of the concept. <i>Nagpapabuti ng aking pagkaunawa sa konsepto ang audio/video.</i>				/
2. Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood. <i>Malinaw at madaling maunawaan ang pagsasalita at pagkukuwento (tamang bilis, intonasyon, at pagbigkas)</i>				/
3. There is complete synchronization of audio with the visuals. <i>Ang audio at visual ay nagsasabay</i>				/
4. Music and sound effects are appropriate and effective for instructional purposes. <i>Angkop at epektibo ang Music at sound effects para sa pagkatuto</i>				/



Factor C. Technical Quality	1 (NS)	2 (P)	3 (S)	4 (VS)
5. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing. <i>Malinis, madaling basahin, at kaakit-akit sa paningin ang mga salitang display sa screen</i>				/
6. Visual presentations (non-text) are clear and easy to interpret. <i>Malinaw at madaling maipaliwanag ang mga biswal na presentasyon (tulad ng larawan at video)</i>				/
7. Math Flipbook's Visuals sustains my interest. <i>Nakakapagpanatili ng aking interes gumagamit ang mga biswal (tulad ng larawan at video) na nasa Math Flipbook</i>				/
8. Visuals provide accurate representation of the concept discussed. <i>Tamang representasyon ng konseptong pinag-aaralan ang ibinibigay ng mga biswal (tulad ng larawan at video).</i>				/
9. The user support materials (if any) are effective. <i>Epektibo para sa akin ang mga pangsuportang materyal na ginamit (kung mayroon man)</i>				/
10. The design allows the target user to navigate freely through the Math Flipbook. <i>Ang disenyo ay nagbibigay ng kalayaan sa gumagamit na mag-navigate sa Math Flipbook.</i>				/
11. The Math Flipbook can easily and independently be used. <i>Kahit walang tulong ng iba ay madaling gamitin ang Math Flipbook.</i>				/
12. Math Flipbook is free from technical problems. <i>Sa aking paggamit ng Math Flipbook ay wala akong problemang teknikal na nakaharap</i>			/	

Factor D. Usability Characteristics	1 (NS)	2 (P)	3 (S)	4 (VS)
D.1 Multimedia Design				
1. The pictures, videos, and other things I see in this Math flipbook look really good and clear. <i>Maganda at malinaw ang mga larawan, mga video, at iba pang bagay na nakikita ko sa Math flipbook</i>				/
2. I can easily understand the instructions that tell me how to use the different parts of this Math flipbook with pictures and videos. <i>Madaling maintindihan ang mga instruction na nagtuturo sa akin kung paano gamitin ang iba't ibang bahagi ng Math flipbook na may mga larawan at video.</i>				/
3. This Math flipbook uses things like pictures and videos in a good way to make learning more fun and interesting. <i>Ginagamit ng Math flipbook nang maayos ang mga bagay tulad ng mga larawan at video upang gawing mas masaya at kawili-wili ang pag-aaral.</i>				/



D.1 Multimedia Design	1 (NS)	2 (P)	3 (S)	4 (VS)
4. The way this Math flipbook looks, with its layout, design, and background, all make sense and help me understand what I'm learning. <i>Ang pagkakayari ng Math flipbook kasama ang pagkakaayos, disenyo, at background nito ay may kahulugan at tumutulong sa akin na maunawaan ang mga itinuturo.</i>				✓
5. When there is a video in this Math flipbook, I can use buttons that I recognize to pause it, change the volume, and move to different parts of the video. <i>Kapag may video sa Math flipbook, maaari kong gamitin ang mga pindutan para itigil ito, baguhin ang tunog, at lumipat sa iba't ibang bahagi ng video.</i>				✓
6. If there is sound or music in this Math flipbook, I can use buttons that I know to pause it, change the volume, and move to different parts of the sound or music. <i>Kung may tunog o musika sa Math flipbook, maaari kong gamitin ang mga pindutan para itigil ito, baguhin ang tunog, at lumipat sa iba't ibang bahagi ng tunog o musika.</i>				✓
7. Every picture in this Math flipbook has words that explain what's happening, and I can easily read them to understand better. <i>Bawat larawan sa Math flipbook ay may mga paliwanag kung ano ang nangyayari, at madali kong mabasa ko ang mga ito upang mas maunawaan.</i>				✓
8. When there are sounds or voices in this Math flipbook, there are words on the screen that show me exactly what is being said, and I can easily read them. <i>Kapag may mga tunog o mga boses sa Math flipbook, may mga salita sa screen na nagpapakita sa akin ng eksaktong sinasabi, at Madali kong mabasa ang mga ito.</i>				✓

D.2 Overall Interface	1 (NS)	2 (P)	3 (S)	4 (VS)
1. The design of this Math flipbook looks really nice and attractive. <i>Napakaganda at kaaya-aya sa paningin ang disenyo ng Math flipbook na ito.</i>				✓
2. The design of this Math flipbook is simple and not crowded, with only the important things and no unnecessary information. <i>Simple at hindi masyadong siksikan ang disenyo ng Math Flipbook, Mahahalagang impormasyon lamang ang nilalaman.</i>				✓
3. The design of this Math flipbook has a theme that looks consistent as I go through different parts of it. <i>Mayroong theme ang disenyo ng Math Flipbook na nananatili sa lahat ng bahagi ng buong module na ito.</i>				✓
4. This Math flipbook has enough information and instructions for me to understand how to use it. <i>May sapat na impormasyon at mga instruction ang Math flipbook upang maunawaan ko kung paano ito gamitin.</i>				✓



D.2 Overall Interface		1 (NS)	2 (P)	3 (S)	4 (VS)
5.	It's easy for me to find my way around and move through this Math flipbook. <i>Madali sa akin ang magpalipat-lipat sa nilalaman ng Math flipbook</i>				✓
6.	The buttons, menus, text, and overall layout of this Math flipbook are always the same and look different from each other, so I can easily recognize them. <i>Ang mga pindutan, menu, salita, at kabuuang disenyo ng Math flipbook na ito ay palaging pareho at magkakaiba ang hitsura, kaya madali kong makikilala ang mga ito.</i>				✓
7.	The words in this Math flipbook are easy to read because the font size, color, and the contrast with the background are just right. <i>Madaling basahin ang mga salita sa Math flipbook na ito dahil tamang-tama ang laki ng letra, kulay, at tugma sa background</i>				✓
8.	I always know what I need to do next because this Math flipbook tells me. <i>Palagi kong alam kung ano ang susunod kong gagawin dahil sinasabi ito ng Math flipbook.</i>				✓
9.	This Math flipbook gives me feedback to let me know if I did things right or if I need to try again. <i>Math flipbook na ito ay nagbibigay sa akin ng tulong at puna o feedback para malaman ko kung tama ang ginawa ko o kung kailangan kong subukan ulit.</i>				✓

D.3 Behavior of Controls & System Information		1 (NS)	2 (P)	3 (S)	4 (VS)
1.	This Math flipbook does what I expect it to do when I interact with it using the buttons available. <i>Ginagawa ng Math Flipbook ang inaasahan ko kapag ako ay may pinagawa rito gamit ang mga pindutang makikita rito.</i>				✓
2.	The pictures or symbols I can choose in this Math flipbook show me what they are for and make it easy to understand. <i>Madali kong nauunawaan ang mga larawan at simbolo sa Math Flipbook dahil nakalagay rito kung para saan ang mga ito.</i>				✓
3.	The buttons, menus, and other things I can click on in different parts of this Math flipbook are always in the same places, so I can find them easily. <i>Ang mga pindutan, menu, at iba pang mga bagay na maaaring pindutin ko sa iba't ibang bahagi ng Math flipbook na ito ay palaging nasa parehong mga lugar, kaya madali kong makikita ang mga ito.</i>				✓
4.	The buttons, menus, and other things I can click on in this Math flipbook look the same or similar. <i>Ang mga pindutan, menu, at iba pang mga bagay na maaaring pindutin ko sa Math flipbook na ito ay magkakatulad o magkamukha.</i>				✓



D.3 Behavior of Controls & System Information		1 (NS)	2 (P)	3 (S)	4 (VS)
5.	When I can select a button or control in this Math flipbook, it gives me information about what it does by changing the way it looks or by showing me something new. <i>Kapag pinili ko ang pindutan o kontrol sa Math flipbook na ito, binibigyan ako ng impormasyon tungkol sa kung ano ang nagagawa nito sa pamamagitan ng paghabago ng hitsura o pagpapakita ng bagong impormasyon.</i>				/
6.	When I click on interactive icon, I can see that it knows I clicked on it because it changes or shows something different. <i>Kapag pinindot ko ang mga interactive icon, naghabago ito o nagpapakita ng ibang bagay.</i>				/

D.4 Customizability/ Support for User Preference		1 (NS)	2 (P)	3 (S)	4 (VS)
1.	I can make the things I see in this Math flipbook bigger or smaller to see them better. <i>Maaari kong gawing mas malaki o mas maliit ang mga bagay na nakikita ko sa Math flipbook upang mas maayos ko silang makita.</i>				/
2.	I can move around and find things easily in this Math flipbook because there are clear and consistent ways to navigate, like using arrows, keyboard shortcuts, or menus. <i>Mayroong malinaw at pare-parehong paraan ng pag-navigate sa Math Flipbook, Kaya madali kong nagagalaw at nahahanap ang mga bagay tulad ng mga arrow, shortcut sa keyboard, o mga menu.</i>				/
3.	If I want to go back to something I did before in this Math flipbook, I can do that and start from there again. <i>Kung gusto kong bumalik sa isang bagay na ginawa ko noon sa Math flipbook na ito, maaari kong gawin iton at magsimula muli mula doon.</i>				/
4.	I can do everything in this Math flipbook using either the mouse or the keyboard. <i>Maaari kong gawin ang lahat ng bagay sa Math flipbook na ito gamit ang mouse o keyboard.</i>				/
5.	I can choose how fast or slow I want to go through the Math flipbook. <i>Maaari kong piliin kung gaano kabilis o kabagal ko gustong magpatuloy sa Math flipbook.</i>				/

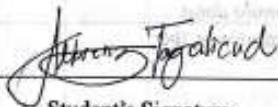
D.5 Hyperlinks		1 (NS)	2 (P)	3 (S)	4 (VS)
1.	The pictures/icon that are clickable and take me to another place have information that tells me where they will take me. <i>Ang mga litrato na maaaring pindutin at nagdadala sa akin sa ibang lugar ay may impormasyon na nagsasabi kung saan nila ako dadalhin.</i>				/
2.	The clickable words (if there's any) are underlined and look different from the other text, which helps me know that they are links.				/



D.5 Hyperlinks		1 (NS)	2 (P)	3 (S)	4 (VS)
Ang mga salitang maaaring pindutin (kung mayroon man) ay may salung-guhit at ibang hitsura mula sa ibang salita, na tumutulong sa akin na malaman na mga ito ay mga link.					
3. The words/pictures that are links look the same all the time in all parts of this Math flipbook.					
Ang mga salitang/litrato na may link ay palaging magkapareho ang hitsura sa lahat ng bahagi ng Math flipbook					✓
4. When I move my mouse over a link or click on it, the mouse cursor or the appearance of the words/picture change to show me that it's a link.					
Kapag inilipat ko ang aking mouse sa isang link o pinindot ito, ang cursor ng mouse o hitsura ng mga salita/litrato ay nagbabago upang ipakita sa akin na ito ay isang link.					✓
5. If a link takes me to something outside of this Math flipbook, it is clearly shown or indicated to me.					
Kung ang isang link ay dadalhin ako sa isang bagay na nasa labas ng Math flipbook, ito ay malinaw na ipinapakita o ipinapahiwatig sa akin.					✓

Comments/Suggestion:

I like this Math Flipbook. I have learned a lot and enjoy at the same time. It is exciting and fun. I like also the story and plot twist. I enjoy the activities and videos also.

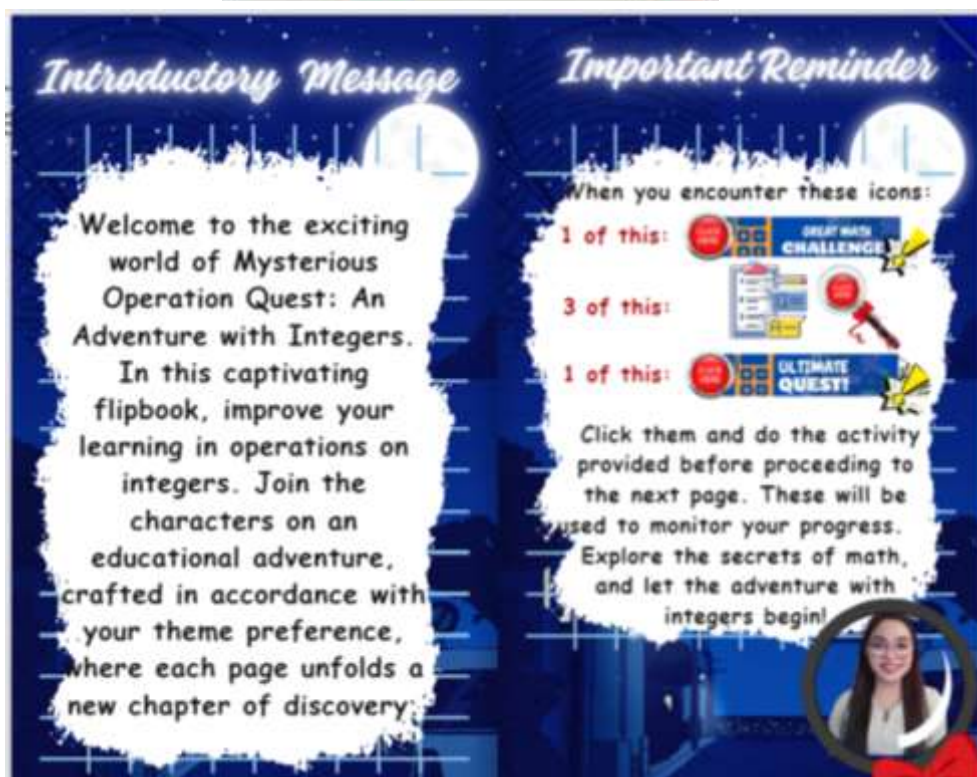


Student's Signature

Date: _____



MATH FLIPBOOK





GREAT MATH Challenge

MYSTERIOUS Operation QUEST

0:00

CLICK HERE

GREAT MATH CHALLENGE

Hello little detective! Please Make sure that you have finished and submitted the Great Math Challenge. There you can find the CODE in order to open the mystery vault.

How many correct answers you got?

Do not be upset if you got low score, together we will improve in this adventure.

If you finished the said challenge, you may proceed to the next video. Enjoy!

Revealing our Friend

0:00

Hello, I'm Conan. I'm also a detective. I help in investigating and solving crimes.

Last time while solving a sensitive case with Ran and Mori, I was hit by a car. Ran and Mori were kidnapped while a group of good Samaritan helped me

I value Ran and Mori so much. They are my family. Can you help me find them and the group of good Samaritan who helped me?

YES **NO**

Let's open the mystery vault that might give us a clue.

Click the vault below



Relax make yourself comfortable...

... and welcome to the world of...

Operations on Integers

THE Mission

1. Accurately apply the rules in performing the four fundamental operations on integers;
2. Solve real-life problems involving the four fundamental operations on integers.

Integer UNVEILED

Integers

Integers is a subset of real numbers that includes whole number (not a fractional number) that can be positive, negative, or zero.

Integers

The subset would look like this:
{... -4, -3, -2, -1, 0, 1, 2, 3, 4...}

Visualizing Integers

How integers are used in daily life?

Integers are commonly used in describing temperature above/below freezing point, a geographical level above/below sea level.

Wow! amazing. I can't believe that I am already encountering integers in real-life

Integer Operation UNLEASHED

Addition OF INTEGERS

Hi! I'm Boots and she's my friend, Dori. Did you know that Addition of Integers can be performed using different ways

Those were introduced to you when you were in elementary.

Like using signed tiles

$4 + (-3) = 1$

Or using number line



These ways let you visualized addition of integers, however you find these hard to use in large numbers, right?

Yes! Don't worry, there is another way.

It is by using rules. It provide a quicker and more streamlined approach to integer addition, especially when dealing with larger numbers.

Rules of Addition +

RULE 1 When the integers have like (same) signs, add the numbers and copy the common sign.

$7 + 4 = 11$

Here 7 is positive and 4 is also positive, they have like (same) signs. So add 7 and 4 then copy the common positive sign. Therefore, the answer is + 11 or 11

$(-5) + (-3) = -8$

Here 5 is negative and 3 is also negative, they have like (same) signs. So add 5 and 3 then copy the common negative sign. Therefore, the answer is -8

0:00 / 2:35

$(-13) + 7 = -6$

13 is negative while 7 is positive, they have unlike (different) signs. So subtract, 13-7 then copy the sign of 13 since it has the greater absolute value. Therefore, the answer is -6.

$12 + (-14) = -2$

12 is positive while 14 is negative, they have unlike (different) signs. So subtract, 14-12 then copy the sign of 14 since it has the greater absolute value. Therefore, the answer is -2.

$16 + (-11) = 5$

16 is positive while 11 is negative, they have unlike (different) signs. So subtract, 16-11 then copy the sign of 16 since it has the greater absolute value. Therefore, the answer is 5.

$(-3) + 7 = 4$

3 is negative while 7 is positive, they have unlike (different) signs. So subtract, 7-3 then copy the sign of 7 since it has the greater absolute value. Therefore, the answer is +4 or 4.

0:00 / 4:21

CLICK HERE



Please make sure that you finished and submitted the task in

If you finished the said task, You may proceed to the next video to continue the adventure

Kidnapper's Task
0:00 / 0:55

Alicia Police Station
0:00 / 1:45

Thank you so much for helping, but my father, Mori, is still with the kidnapper. The kidnapper said we have to go to the Alicia Police Station

Click the photo or video icon, if you want to know better about PROSTETS

Click the photo or video icon, if you want to know better about HYPOTHESIS

Subtraction OF INTEGERS

Congratulations!!! You have just learned how to add integers with like and unlike signs.

This time, you are now ready for the subtraction of integers

Just like in addition of integers, you can also use signed tiles and number line

However, these methods hardly work in large numbers and following rules is lot easier

Also, since you are already in 7th grade, this is your preparation for higher-level math. Enjoy!

Subtraction OF INTEGERS

General RULE To subtract two integers, add the opposite or additive inverse of the subtrahend to the minuend.

STEP 1 Keep Change Change (KCC)
• Keep the 1st integer the same
• Change the subtraction sign to addition
• Change the sign of the second integer

STEP 2 Follow the rules for addition
1 When the integers have like (same) signs, add the numbers and copy the common sign.
2 When the integers have unlike (different) signs, subtract the numbers and use the sign of the number with the greater absolute value.



Given: $5 - 7 = ?$

STEP 1 Keep Change Change (KCC)

- 5 • Keep the 1st integer the same
- +
- 7 • Change the subtraction sign to addition
- Change the sign of the second integer

Now we have:

$5 + (-7) = ?$

STEP 2 Follow the rules for addition

Ans: $5 + (-7) = -2$

5 is positive while 7 is negative, they have **unlike (different) signs**. So subtract, $7-5$ then copy the sign of 7 since it has the **greater absolute value**. Therefore, the answer is -2.

Given: $(-8) - (-2) = ?$

STEP 1 Keep Change Change (KCC)

- 8 • Keep the 1st integer the same
- +
- 2 • Change the subtraction sign to addition
- Change the sign of the second integer

Now we have:

$(-8) + 2 = ?$

STEP 2 Follow the rules for addition

Ans: $(-8) + 2 = -6$

8 is negative while 2 is positive, they have **unlike (different) signs**. So subtract, $8-2$ then copy the sign of 8 since it has the **greater absolute value**. Therefore, the answer is -6.

Given: $6 - (-4) = ?$

STEP 1 Keep Change Change (KCC)

- 6 • Keep the 1st integer the same
- +
- 4 • Change the subtraction sign to addition
- Change the sign of the second integer

Now we have:

$6 + 4 = ?$

STEP 2 Follow the rules for addition

Ans: $6 + 4 = 10$

Here 6 is positive and 4 is also positive, they have **like (same) signs**. So add 6 and 4 then copy the **common positive sign**. Therefore, the answer is +10 or 10

Given: $(-10) - 5 = ?$

STEP 1 Keep Change Change (KCC)

- 10 • Keep the 1st integer the same
- +
- 5 • Change the subtraction sign to addition
- Change the sign of the second integer

Now we have:

$(-10) + (-5) = ?$

STEP 2 Follow the rules for addition

Ans: $(-10) + (-5) = -15$

Here 10 is negative and 5 is also negative, they have **like (same) signs**. So add 10 and 5 then copy the **common negative sign**. Therefore, the answer is -15.



Subtraction of Integers
0:00 / 5:50

Kidnapper's Task
0:00 / 2:22

CLICK HERE

Please make sure that you finished and submitted the task in

If you finished the said task, You may proceed to the next video to continue the adventure

Finally! Mori is with us.

That calls for a celebration! But the kidnapper want us to go to the Echague Police Station. Let's Go!

Echague Police Station

Multiplication & Division OF INTEGERS

The kidnapper is really testing us

Indeed!

But this is not the time to give up. Let's now learn how to multiply and divide integers

Why do we have to learn multiplication and division at the same time?

Great question! we are going to learn multiplication and division of integers at the same time because these operations have the **SAME RULES**. Let's proceed!

Click/tap the police officer



RULES Multiplication & Division OF INTEGERS

When you multiply or divide two numbers with like (same) signs, the product or quotient is positive.

RULE 1

Multiplication: $(+)(+) = (+)$
 $(-)(-) = (+)$

Division: $\frac{+}{+} = +$
 $\frac{-}{-} = +$

Multiplication

(8) (6) = 48

Here 8 is positive and 6 is also positive, they have like (same) signs. So multiply 8 and 6 then make the sign of the answer (product) positive. Therefore, the answer is +48 or 48

Division

$\frac{(-7)(-9) = 63$

Here 7 is negative and 9 is also negative, they have like (same) signs. So multiply 7 and 9 then make the sign of the answer (product) positive. Therefore, the answer is +63 or 63

$\frac{8}{4} = 2$

Here 8 is positive and 4 is also positive, they have like (same) signs. So divide 8 by 4 then make the sign of the answer (quotient) positive. Therefore, the answer is +2 or 2

$\frac{-12}{-3} = 4$

12 is negative and 3 is also negative, they have like (same) signs. So divide 12 by 3 then make the sign of the answer (quotient) positive. Therefore, the answer is +4 or 4

When you multiply or divide two numbers with unlike (different) signs the product or quotient is negative.

RULE 2

Multiplication: $(+)(-) = (-)$
 $(-)(+) = (-)$

Division: $\frac{+}{-} = -$
 $\frac{-}{+} = -$

Multiplication

(10) (-4) = -40

10 is positive while 4 is negative, they have unlike (different) signs. So multiply, 10 and 4, then make the sign of the answer (product) negative. Therefore, the answer is -40.

Division

$\frac{(-9)(11) = -99$

9 is negative while 11 is positive, they have unlike (different) signs. So multiply, 9 and 11, then make the sign of the answer (product) negative. Therefore, the answer is -99.

$\frac{20}{-5} = -4$

20 is positive while 5 is negative, they have unlike (different) signs. So divide 20 by 5 then make the sign of the answer (quotient) negative. Therefore, the answer is -4



The interface is split into two main sections. The left section, titled "Multiplication & Division of Integers", features a video player showing a math lesson. The lesson explains that 45 is negative and 9 is positive, so they have unlike (different) signs. It instructs to divide 45 by 9 and then make the sign of the answer (quotient) negative, resulting in -5. The right section, titled "Kidnapper's Task", features a video player and a character named Conan. Conan is a detective wearing a brown hat and a yellow shirt. He has a speech bubble that says: "Please make sure that you finished and submitted the task in". Another speech bubble says: "If you finished the said task, You may proceed to the next video to continue the adventure". There is a red button labeled "CLICK HERE" and a clipboard with a checklist. The background is a dark blue night sky with a full moon and a city skyline at the bottom.

The interface is split into two main sections. The left section, titled "Kidnapper's Story", features a video player showing a scene with a red car. There are three speech bubbles from a character: "That is sad. His hard earned money just went to waste.", "Don't cry, the kidnapper sent another video. He said this is his big revelation. The reason why he indulge himself to this wrong doing.", and "Please play the video. Let's investigate the whole story.". The right section features a character named Conan, who is a detective wearing a brown hat and a yellow shirt. He has a speech bubble that says: "You see? That is my story. I'm sorry for giving you burden. I just want to prolong the life of my daughter". Another speech bubble says: "I cannot even visit her at the hospital because I am not allowed to, I am on the wanted list.". A third speech bubble says: "I am into Conan because he looks like my daughter.". The background is a dark blue night sky with a full moon and a city skyline at the bottom.





Message for you
00:01:00:20

Unfolding My Story

Now that you know my whole story, what can you say about my life?

I'm just a father, overwhelmed by my daughter's illness and mounting hospital bills.

I had always been a loving and law-abiding man...

...but desperation led me down a dark path. How my story would end is now in your hands.

I'd love for you to continue my story, with your creative twist.

you can use any dialect or language you want (English, Filipino, Ilocano). You can submit your work in the drive, just click the button below

[CLICK HERE](#)

Let your ending of my story be featured in our next journey!

Until our next adventure!

Rules in Operations on Integers

ADDITION

RULES OF INTEGERS

RULE 1 When the integers have like (same) signs, add the numbers and copy the common sign.

RULE 2 When the integers have unlike (different) signs, subtract the numbers and use the sign of the number with the greater absolute value.

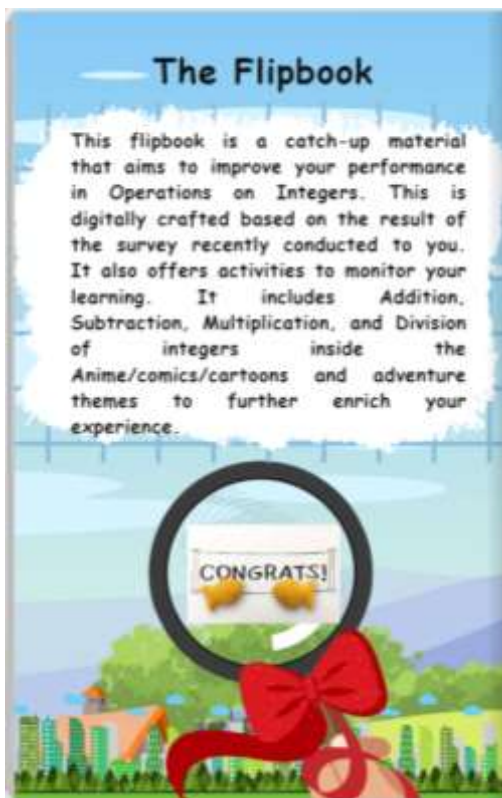
SUBTRACTION

RULE OF INTEGERS

General RULE To subtract two integers, add the opposite or additive inverse of the subtrahend to the minuend.

STEP 1 Keep Change Change (KCC)

- Keep the 1st integer the same
- Change the subtraction sign to addition
- Change the sign of the second integer





PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education

CURRICULUM VITAE

Name Rochelle Kaye I. Villena
Date of Birth April 28, 1999
Place of Birth Nagbukel, San Isidro, Isabela

Educational Attainment

Collegiate Bachelor in Mathematics Education
Philippine Normal University-North Luzon; 2019

Honors, Scholarships/Study Grants and Awards Received

Magna Cum Laude
Philippine Normal University-North Luzon; 2019

Recipient: Department of Science and Technology Scholarship
(R.A 7687); 2015-2019

Valedictorian
San Isidro National High School; 2015

Valedictorian
Nagbukel Elementary School; 2011

Work Experiences

2021-Present Teacher 1, Cebu Integrated School, Cebu San
Isidro, Isabela