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iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577



The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Grade Seven Least Learned Competencies on Number Systems: Context for Interactive E-Module Development and Validation

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Received: 14 March 2025

Revised: 16 April 2025

Accepted: 18 April 2025

Available Online: 19 April 2025

Volume IV (2025), Issue 2, P-ISSN – 2984-7567; E-ISSN - 2945-3577

<https://doi.org/10.63498/etcor283>

Abstract

Aim: This study determined the least learned competencies (LLCs) in the Number Systems domain of Grade Seven Mathematics at Libertad National High School and to develop, evaluate, and validate an interactive e-module that addresses these competencies, enhancing students' conceptual understanding and procedural fluency.

Methodology: This study used a Developmental Research design to identify and address the least learned competencies (LLCs) in the Number Systems domain among Grade 7 students at Libertad National High School, South Cotabato. The study began with administering a standardized test, adopted from DepEd South Cotabato, to 235 Grade 7 learners to determine gaps in learning. These results guided the development of an interactive e-module, designed using tools like Microsoft Word, PowerPoint, Adobe Acrobat, and Lumi. The school was chosen due to its large and diverse student population, as well as observed learning difficulties in number systems, particularly with fractions and decimals. To ensure content accuracy and effectiveness, the module was evaluated by a panel of experts composed of Mathematics educators, a module development specialist, and an IT expert. The evaluation process included both expert assessments and a usability try-out involving 70 Grade 7 learners and 5 Mathematics teachers. Evaluation tools included rating sheets adapted from Lumaque (2017), the Innovative Technology Center (2021), and Alegre (2011), measuring aspects such as clarity, relevance, attainability, appeal, conformity to standards, usability, and effectiveness. Data collected from these evaluations were analyzed using frequency, weighted mean, standard deviation, and ranking. The combination of expert validation and learner feedback helped confirm the quality and potential of the e-module as a supplementary learning tool to improve student performance in Mathematics.

Results: The results of the study showed that out of 30 items in the standardized test on Number Systems administered to 235 Grade 8 learners, seven items were identified as Least Learned Competencies (LLCs), having less than 50% correct responses. These items were numbers 1, 4, 8, 15, 19, 20, and 22, with item 20 receiving the lowest correct response rate of 42.98%. The remaining items were classified as Average (A) and Most Learned (ML), showing a range of mastery among students. These specific LLCs became the basis for developing the interactive e-module that focused on areas such as integer operations, real number representation, and number form conversions. The developed e-module was evaluated by a panel of content experts and end users, with results showing high ratings across several criteria. Attainability received a mean score of 3.86 (SD=0.31), clarity scored 3.74 (SD=0.44), relevance 3.86 (SD=0.36), appropriateness 3.74 (SD=0.51), appeal 3.81 (SD=0.40), conformity to standards 3.86 (SD=0.36), and innovativeness 3.61 (SD=0.50). Usability and potential effectiveness were also rated highly by both Grade 7 learners and teachers, with mean scores above 3.50, indicating strong agreement with the positive aspects of the module.

Conclusion: The findings of this study highlight specific learning gaps in the Number Systems domain among Grade Seven students, particularly in the areas of integer operations, real number representation, and number form conversions. The identification of seven Least Learned Competencies through standardized testing provided a strong foundation for the development of a targeted interactive e-module. By aligning the content of the e-module with these learning gaps, the study was able to address the precise areas where students demonstrated persistent difficulties, supporting a more data-driven and responsive approach to instruction. The positive evaluations from both



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content experts and end users affirm the e-module's overall quality and potential as an effective supplementary learning tool. High ratings in usability, relevance, attainability, and appeal suggest that the module is not only pedagogically sound but also engaging for learners. These results underscore the importance of integrating technology and interactive design in addressing common learning challenges in mathematics, particularly in topics like Number Systems.

Keywords: *Least Learned Competencies, Number Systems, Interactive e-module, Research and Development (R&D), K-12 MATATAG Curriculum*

INTRODUCTION

In today's 21st-century classroom, learning is no longer limited to chalkboards and textbooks. The integration of Information and Communication Technologies (ICT) has reshaped how education is delivered and received, pushing schools to adopt more engaging, tech-driven methods. The Department of Education (DepEd) in the Philippines responded to this shift through its Computerization Program under the Digital RISE of Public Schools Future Framework. This initiative moves beyond treating ICT as a stand-alone subject—it encourages its use as a dynamic teaching and learning tool (Department of Education, 2019). Especially during and after the COVID-19 pandemic, this move toward digital learning has been crucial in bridging learning gaps and promoting digital literacy among Filipino students and teachers.

Despite these advancements, many Filipino students continue to struggle in mathematics. As noted by Riconalla (2022) –math is still perceived as one of the most challenging subjects for high school learners. The World Bank (2020) pointed out that large class sizes, limited resources, and lack of individualized support are some of the key barriers to success in math education. This issue is reflected in international assessments like the TIMSS and PISA, which have shown that the Philippines consistently ranks low in both science and math (Martin et al., 2012). Specific difficulties in Number Systems—especially when it comes to understanding negative numbers—are well-documented. Almeida and Bruno (2014) found that students in grades 7 to 9 often struggle with number line interpretation, magnitude comparisons, and basic operations with negative values, which can later affect their understanding of rational numbers.

These challenges are also evident at Libertad National High School, where Grade 7 learners consistently struggle with solving problems involving integers. According to Fuadiah, et al. (2017), students often face difficulties in understanding negative numbers due to conceptual gaps and confusion with mathematical vocabulary such as "positive," "negative," and "absolute value." As Ole and Gallos (2021) explained, a solid grasp of number systems is fundamental to mastering more complex mathematical concepts. Educators, therefore, are tasked with addressing these misconceptions while maintaining student engagement. Ní Shé, et al. (2023) highlighted how technology-enhanced resources can positively influence student engagement in mathematics education. Interactive learning materials have shown promise in addressing these challenges. Gregorio and Rabut (2024), for instance, introduced SIMULE (Strategic Intervention Materials Using Lumi Education) to enhance students' conceptual understanding and procedural fluency, while Alegre (2011) noted that learners performed better when mathematical concepts were presented through interactive and visual formats.

In response to these needs, DepEd has intensified its push for ICT-assisted teaching and learning through its Digital RISE Program (DepEd, 2022). However, implementation in some regions—such as South Cotabato—is still lagging compared to private schools, where tools like LCD projectors and Wi-Fi access are more readily available. As Orleans (2017) reported, many public school teachers still describe the availability of digital resources as "limited." This lack of support inspired the researcher to develop an interactive e-module focused on the least learned competencies in Number Systems, aligned with the Department of Education's K to 12 curriculum. By offering a contextualized and engaging digital resource, this e-module aims to fill existing gaps and support more meaningful and accessible math learning for Filipino students.

Objectives

This study aimed to develop interactive e-modules as supplementary learning materials in Number Systems for Grade 7 Mathematics.

Specifically, it sought to answer the following questions:

1. What are the Least Learned Competencies (LLCs) of Grade Seven learners in Number Systems?



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2. What appropriate parts for e-module can be developed to address the learners' least learned competencies?
3. What is the evaluation of the content experts on developed learning e-module in terms of:
 - 3.1 attainability,
 - 3.2 clarity,
 - 3.3 relevance,
 - 3.4 appropriateness,
 - 3.5 appeal,
 - 3.6 innovativeness, and
 - 3.7 conformity to standards?
4. What is the evaluation of Grade Seven Math learners and teachers on developed e-module in terms of
 - 4.1. usability, and
 - 4.2 potential effectiveness of the E-module?

METHODS

Research Design

This study utilized Developmental Research. This approach, as defined by Alegre (2005), focuses on collecting and analyzing numerical data to describe, explain, and understand a specific phenomenon or population. In the context of this investigation, the research aimed to describe the least mastered competencies in number systems among Grade 7 students. By integrating standardized assessment data with the insights of experienced mathematics teachers, this research design provided a robust foundation for the development and subsequent validation of an interactive e-module specifically designed to address the identified learning gaps in number systems for Grade 7 students.

Population and Sampling

This study was conducted at Libertad National High School in South Cotabato, Region XII, chosen for its large and diverse student population of over 6,450 learners across both junior and senior high school levels. The school was strategically selected due to observed and reported difficulties among Grade 7 students in understanding key mathematical concepts, particularly in number systems. These challenges were confirmed through informal discussions with students and interviews with mathematics teachers, who pointed to ongoing struggles with topics like fractions and decimals. Aligned with the principles of action research (Mertler, 2019), the study seeks to address real-world educational issues within this specific context and aims to improve mathematics instruction through contextually relevant interventions.

The study involved a total of 238 Grade Seven Mathematics learners from Libertad National High School, selected through Stratified Random Sampling to identify the least learned competencies. Additionally, five Mathematics education experts, one module expert, and one IT expert/developer participated in the evaluation process. In the initial phase, 70 Grade 8 learners took a standardized test on Number Systems to determine learning gaps. For the try-out phase of the developed e-module, 70 Grade Seven students were engaged, while a panel of jurors—comprising Math education experts with either a PhD or a Master's degree in Mathematics Education—was tasked to validate the content and design of the interactive e-module.

This research employed Stratified Random Sampling, a probability sampling technique, to select participants from the Grade 7 learners at Libertad National High School. With 11 Grade 7 sections available, the researcher randomly chose specific groups to form the sample. The selected groups were then used to ensure a diverse range of participants with varying backgrounds and experiences, which is crucial for the validity of the developed interactive module.

Instrument

This research utilized several standardized instruments for data collection and evaluation. A standardized test on Number Systems, adopted from the Department of Education (DepEd) South Cotabato Division (DepEd, 2018), was used to identify the least learned competencies among Grade 7 learners. The evaluation of the e-module involved a rating sheet to assess criteria such as attainability, clarity, relevance, appropriateness, appeal, conformity to standards, and innovativeness, adapted from Lumaque (2017). Additionally, a Learners' Evaluation Form based on the International Test Commission's (ITC, 2021) Teaching with Technology form was used to gather feedback on the



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e-module's usability from Grade 7 learners. A validated instrument, modified by Alegre (2011), was also employed to assess the technical quality of the e-module, ensuring its alignment with the Number Systems topic. Learners rated their experiences using a 4-point scale ranging from Strongly Agree (SA) to Strongly Disagree (SD).

Data Collection

The research journey began with a formal communication letter sent to the Schools Division Superintendent of South Cotabato, clearly explaining the purpose and goals of the study. Once permission was granted, the researcher personally facilitated the distribution of a standardized test to Grade 7 learners at Libertad National High School to find out which topics in Number Systems were the most difficult for students, referred to as the Least Learned Competencies (LLCs). These results served as the blueprint for creating a more engaging and interactive e-module. Using familiar tools like Microsoft Word, PowerPoint, and Lumi Education, the researcher designed the module with the needs of the learners in mind. Afterward, a group of Math content experts, IT specialists and E-Module Expert reviewed the module, offering feedback on its quality through evaluation forms. The final step involved letting actual Math teachers and Grade 7 students try out the module themselves. They were encouraged to share their honest experiences through user-friendly evaluation forms, helping the researcher understand how effective and engaging the module really was from the perspective of those who would be using it the most.

Treatment of Data

The results of the study were interpreted using a combination of statistical tools to ensure clarity and accuracy. To identify the least learned competencies in Number Systems, the researcher used frequency, percentage, and ranking, in line with DepEd Order No. 8, s. 2025. Competency performance was measured by calculating the percentage of correct responses from students, which then guided the classification of competencies as "Most Learned," "Average," or "Least Learned." For the evaluation of the developed e-module, weighted mean, percentage, and standard deviation were used to analyze jurors' feedback. IT experts and module users—including teachers and students—evaluated the e-module using a Likert Scale (1 to 4), with scores reflecting various aspects such as clarity, relevance, and usability. These ratings were interpreted qualitatively based on the weighted averages, offering insights into both the technical quality and instructional potential of the e-module.

Ethical Considerations

This study adhered to strict ethical guidelines, prioritizing the protection and respect of all participants. Prior to data collection, letters detailing the study's purpose, procedures, potential risks, and benefits were sent to identified schools, seeking their cooperation and informing them of the voluntary nature of teacher participation. Teachers and learners were explicitly informed that their participation was entirely voluntary and that they were free to withdraw at any point without consequence, ensuring no coercion was involved. Informed consent was obtained, emphasizing confidentiality and anonymity in data handling, with data securely stored and access restricted to the researcher. The study design minimized potential harm, and participants were treated with respect, ensuring their rights to privacy and autonomy were upheld.

RESULTS and DISCUSSION

This is the development and testing of an interactive e-module for Grade Seven Mathematics. It begins with a descriptive data analysis of identified Least Learned Competencies (LLCs) in Number Systems, informing the design and development of the interactive e-module. Finally, it outlines the tryout results from Grade Seven Mathematics teachers and students, using tables and figures to clearly illustrate the gathered data.

Analysis of Least Learned Competencies (LLCs) of Grade Seven Learners in Number Systems

To determine the least learned competencies in Grade Seven Number Systems, the researchers used frequency and percentage. In a thirty- item standardized test, table 5 shows the aggregated number of responses of 235 Grade Eight learners and percentage of correct responses.

Table 1 presents a quantitative analysis of Grade Seven learners' performance in a standardized test on Number Systems, utilizing frequency and percentage to identify Least Learned Competencies (LLCs). The data, derived from 235 Grade Eight respondents, reveals a significant variance in mastery, with seven items falling below



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the 50% correct response threshold, designated as "Least Learned (LL)." This underscores specific areas of conceptual difficulty within the Number Systems curriculum.

The prevalence of "Average (A)" performance across 18 items suggests a moderate understanding, yet highlights the necessity for pedagogical adjustments to elevate comprehension across the board. The identification of items categorized as "Most Learned (ML)" provides a baseline for successful instructional strategies, which can be leveraged to address the identified LLCs.

Table 1
Comparative Results for 30- item Standardized Test

NO	Number of Responses		% of correct responses	NO	Number of Responses		% of Correct Responses
	Correct	Mistakes			Correct	Mistakes	
1	115	120	48.94 % LL	16	157	78	66.81 % A
2	180	55	76.60 % ML	17	130	105	55.32 % A
3	162	73	86.00 % ML	18	134	101	57.02 % A
4	110	125	46.81 % LL	19	107	128	45.53 % LL
5	125	110	53.19 % A	20	101	134	42.98 % LA
6	157	78	66.81 % A	21	169	66	71.91 % A
7	180	55	76.60 % ML	22	112	123	47.66 % LL
8	112	123	47.66 % LL	23	124	111	52.77 % A
9	119	116	50.64 % A	24	135	100	57.45 % A
10	147	88	62.55 % A	25	127	108	54.04 % A
11	125	110	53.19 % A	26	131	104	55.74 % A
12	180	55	76.60 % ML	27	135	100	57.45 % A
13	163	72	69.36 % A	28	156	79	66.38 % A
14	175	60	74.47 % A	29	168	67	71.49 % A



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15	103	132	43.83 % LL	30	137	98	58.30 % A
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The specific items categorized as LLCs, namely 1, 4, 8, 15, 19, 20, and 22, warrant consideration for the design and development of an interactive e-module for Number Systems. These items represent critical junctures where students' grasp of Number Systems falters, potentially indicating gaps in foundational knowledge or ineffective instructional approaches. The item with the lowest performance, item 20, with only 42.98% correct responses, infers low understanding by learners among learning competencies.

Table 2 shows the summary of Least Learned Competencies (LLCs) in Grade Seven Number Systems, aligning specific test items with corresponding curriculum codes and mathematical skills. The identified LLCs, encompassing procedural fluency and conceptual understanding across integer operations (M7NS-1c-d-1; M7NS-1h-1), real number representation (M7NS-1d-2; M7NS-1i-1), and number form conversions (M7NS-1e-1), reveal key areas necessitating instructional reinforcement. This structured approach, grounded in empirical data, ensures the e-module's design is directly responsive to documented student learning gaps.

Table 2
Summary of Least Learned Competencies in Number Systems

Item Number	Codes	Least Learned Competencies
1	M7NS-1c-d-1	illustrates the different properties of operations on the set of integers.
4	M7NS-1d-2	represents real-life situations and solves problems involving real numbers.
8	M7NS-1e-1	performs fundamental operations on integers.
15	M7NS-1h-1	arranges real numbers in increasing or decreasing order and on a number line.
19	M7NS-1i-1	writes numbers in scientific notation and vice versa
22	M7NS-1i-1	expresses rational numbers from fraction form to decimal form and vice versa.

The strategic utilization of Table 2 for e-module development underscores the importance of data-driven instructional design. By directly addressing the identified LLCs, the e-module can provide targeted, interactive, and personalized learning experiences. This approach moves beyond generic remediation, offering tailored support for specific mathematical concepts where students demonstrate persistent challenges. The integration of interactive simulations, visual aids, and adaptive learning features within the e-module has the potential to enhance conceptual understanding and procedural fluency, ultimately improving student achievement in Number Systems.

Development of Appropriate Parts for e-Module to Address Learners' Least Learned Competencies

After identifying the areas where students struggled most with Number Systems, the researcher poured thoughtful effort into refining an interactive e-module made just for them. The goal was simple but meaningful—to help Filipino learners better understand math concepts that many find confusing or difficult. Instead of overwhelming



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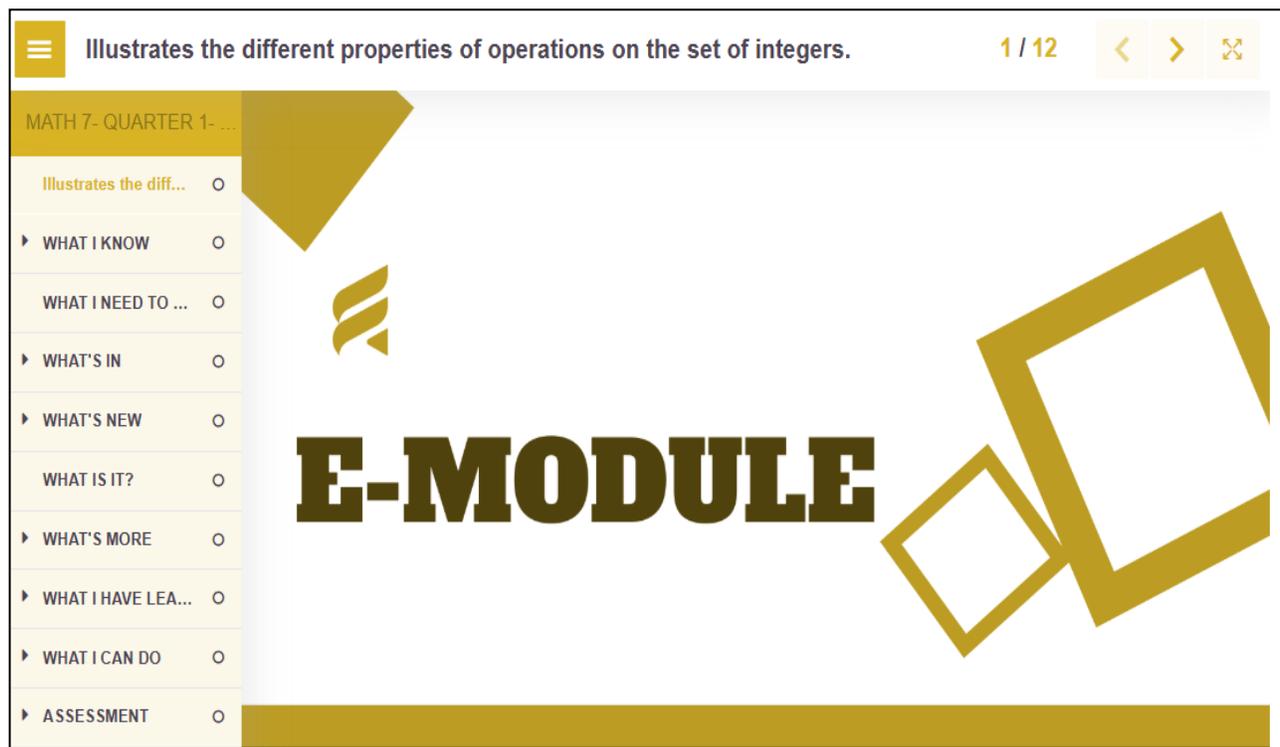
students with abstract ideas, the updated e-module was built to be supportive, easy to follow, and most importantly, relatable. It's all about guiding learners at their own pace, helping them build confidence as they go.

The e-module follows a well-organized structure designed to feel like a learning journey. It starts with "What I Know" to see what students already understand, followed by "What I Need to Know" which lays out clear goals. "What's In" refreshes past lessons, and "What's New" brings in new concepts using engaging multimedia. As learners move on, "What Is It" explains the topic in detail, while "What's More" provides practice activities. There's also space to reflect in "What I Have Learned," apply skills in "What I Can Do," and check progress through "Assessment." Extra activities are provided for those who want to learn more. This thoughtful flow ensures students aren't just learning—they're connecting with the material in a meaningful way.

Beyond the lessons themselves, the e-module includes features that make learning more enjoyable and accessible. From interactive visuals and games to progress tracking and personalized learning paths, everything was designed with real students in mind. It supports different learning styles, offers feedback when learners need help, and even includes offline access for those without a stable internet connection. Real-life examples are woven in to show how math applies to everyday situations—making the lessons not just informative but also relevant.

By combining clear explanations, engaging activities, and a student-centered approach, the e-module offers a fresh way to learn math. It's not just a tool—it's a companion in learning, helping students build skills they'll use well beyond the classroom. Whether learners are brushing up on basics or tackling tougher topics, this e-module meets them where they are and supports them as they grow.

Figure 1
Developed Interactive E-module



As shown in Figure 1, the developed interactive e-module includes 12 distinct pages. Each page functions similarly to a physical module, offering instructional materials, quizzes, and assessment forms to gauge learners' understanding. Additionally, a rating system is built into the interface to provide feedback and further enhance the



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overall user experience. The e-module incorporates visually engaging diagrams to enhance the user interface (Kruk & Lubas, 2017), recognizing the importance of visual elements in learning and user engagement. It also includes a tracking system that monitors learners' progress as they move through the content.

Evaluation of Content Experts on the Developed e-Module

The following information Summarizing the overall evaluation of the e-module, Table 3 presents its effectiveness across various key areas, providing a comprehensive assessment of its impact on learning outcomes, user engagement, and instructional design.

Table 3
Content Experts' Rating on the Learning Objectives and Contents of the Developed Interactive e-Module

Area	Mean	SD	Interpretation
Attainability	3.86	0.31	Attainable
Clarity	3.74	0.44	Very Clear
Relevance	3.86	0.36	Very Relevant
Appropriateness	3.74	0.51	Very Appropriate
Appeal	3.81	0.40	Very Appealing
Conformity to Standards	3.86	0.36	Strongly Conforming
Innovativeness	3.61	0.50	Very Innovative

The attainability of learning objectives, rated as attainable (M=3.86, SD=0.31), suggests that the module establishes realistic learning targets, ensuring that mathematical concepts in number systems are within students' cognitive reach. Likewise, its clarity, rated as very clear (M=3.74, SD=0.44), indicates that the explanations, instructions, and examples are effectively structured to minimize confusion and facilitate comprehension. This underscores the role of well-organized digital resources in promoting conceptual mastery and enhancing student engagement (Mayer, 2014).

The module's relevance to its intended purpose, rated as very relevant (M=3.86, SD=0.36), confirms its alignment with students' learning needs, emphasizing the necessity for instructional materials to adhere to curricular and pedagogical standards. Similarly, its appropriateness in addressing specific competencies, rated as very appropriate (M=3.74, SD=0.51), reinforces its effectiveness in achieving targeted learning outcomes. These findings highlight the importance of designing educational resources that are both contextually relevant and academically rigorous (Wiggins & McTighe, 2011).

Furthermore, the module's appeal, rated as very appealing (M=3.81, SD=0.40), suggests that it successfully fosters student motivation and engagement. This underscores the significance of integrating interactive and visually stimulating elements in digital learning materials to sustain student interest (Keller, 2010).

From a standardization perspective, the module's strong conformity to educational benchmarks (M=3.86, SD=0.36) affirms its alignment with prescribed learning competencies, demonstrating the efficacy of structured frameworks in maintaining instructional quality. Additionally, its high rating in innovativeness (M=3.61, SD=0.50) highlights its creative approach to teaching number systems, suggesting that incorporating gamification, real-world applications, and interactive problem-solving can enhance the accessibility and engagement of abstract mathematical concepts (Ryan & Deci, 2017).

Overall, the evaluation results presented in Table 14 provide compelling evidence for the e-module's effectiveness as an instructional tool. The module's strengths in attainability, clarity, relevance, appropriateness, appeal, conformity to standards, and innovativeness collectively contribute to its potential to enhance learning outcomes, promote student engagement, and support effective teaching practices. These findings underscore the



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importance of designing and developing digital learning resources that are not only aligned with curriculum standards but also engaging, accessible, and innovative.

Evaluation of End-users on the Developed e-Module

After taking into account the insights shared by content experts, the researcher created an HTML version of the e-module so that both learners and teachers could easily access and explore it at their own pace. Once the module was made available, users were encouraged to interact with its different features and navigate through the lessons. After using the e-module, they shared their thoughts through a usability evaluation form, reflecting on how easy it was to use, how clear the instructions were, and how helpful the content was in supporting their learning. Table 4 captures the feedback given by these end-users, offering a glimpse into their experience with the e-module as a digital learning tool.

Table 4
End-users’ Responses on the Usability of e-module as Learning Tool

Area	Teacher			Learners		
	Mean	SD	Interpretation	Mean	SD	Interpretation
Usability	3.75	0.39	Strongly Agree	3.55	0.50	Strongly Agree
Potential Effectiveness of the e-Module	3.60	0.53	Strongly Agree	3.61	0.52	Strongly Agree

Table 4 offers a clear glimpse into how both learners and teachers felt about using the interactive e-module—and the results are genuinely encouraging. With average scores consistently above 3.50, interpreted as “Strongly Agree,” it’s clear that both groups found the e-module not only helpful, but also easy and enjoyable to use. This kind of feedback shows that the module really connected with its users and made learning Number Systems feel more approachable.

What makes this even more meaningful is that the module was designed with the learners and teachers in mind. Just as Norman (1988) emphasized in his work on user-centered design, when we take the time to understand what users truly need, we can create tools that aren’t just functional—but also supportive and engaging. This was exactly the case here. The e-module wasn’t just about delivering math content; it was about delivering it in a way that made sense to students, that felt natural to teachers, and that encouraged everyone to keep going.

And the impact goes beyond just ease of use. The strong agreement on the e-module’s potential shows it can really make a difference in helping students understand tricky concepts—something that’s often a challenge in subjects like Math. As Mayer (2014) pointed out, interactive and well-structured tools can help learners make sense of even the most abstract ideas. In the case of this module, it’s a step forward in making Number Systems not just something to memorize, but something to truly understand.

Ultimately, this feedback tells a story of how thoughtful design, meaningful content, and a little bit of tech can come together to create something powerful—something that helps both teachers and learners feel supported on their journey through mathematics.

Conclusions

The assessment of students’ performance revealed several least learned competencies in Mathematics, particularly within the domain of Number Systems. These include understanding properties of operations on integers, solving real-life problems involving real numbers, performing basic operations with integers, ordering real numbers, converting between scientific and standard notations, and expressing rational numbers in both fraction and decimal forms. Students were observed to struggle with translating word problems into equations, handling negative numbers, interpreting number lines, and distinguishing between different numerical representations. These



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challenges were often compounded by common misconceptions and computational errors, which hindered their overall proficiency and mathematical confidence.

More specifically, difficulties in understanding operations involving negative numbers often led to repeated mistakes and weakened their problem-solving capabilities. The challenge in solving real-life problems involving real numbers suggests a gap in contextual learning and a need for improved strategies in applying mathematical concepts to practical scenarios. Similarly, confusion around number lines and ordering values reveals a deficiency in number sense, a foundational skill for higher-level mathematics. Issues with scientific notation and conversions also point to gaps in understanding place value and exponents, which are crucial in subjects like science and technology. These learning gaps highlight the importance of targeted instructional support and innovative teaching tools.

The development of an interactive e-module was a direct response to these challenges. Designed with structured instructional content, assessment activities, real-life problem applications, and offline accessibility, the module aimed to make learning more engaging and flexible. The high evaluation ratings from content experts—particularly in areas of attainability, clarity, relevance, and appropriateness—affirm the module's effectiveness in achieving learning goals. Evaluators also noted the module's appeal and innovativeness, emphasizing its ability to promote independent learning and sustained engagement. The module's alignment with Department of Education standards ensures pedagogical soundness while offering a modern approach to mastering complex math concepts. These findings affirm the value of thoughtfully designed digital resources in improving students' mathematical understanding and motivation.

Recommendations

Junior High School Mathematics teachers, especially those in South Cotabato, are encouraged to intensify instruction in the identified least learned competencies through focused lessons on fundamental operations and problem-solving. Curriculum developers may fully integrate the e-module into instructional planning and further innovate by designing activities that address students' unique needs. Government agencies like the Department of Education – South Cotabato and the Department of Science and Technology may consider refining the module based on expert feedback and supporting its wider implementation. Teachers are also encouraged to offer flexible learning options that accommodate students' preferences and learning environments. Finally, future researchers may explore the module's long-term effectiveness in enhancing conceptual understanding, problem-solving skills, and students' learning behavior in Mathematics, contributing further to the evolving landscape of tech-assisted education.

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P - ISSN 2984-7567
E - ISSN 2945-3577



The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

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