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Development and Evaluation of E-Module for Numeracy

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ABSTRACT

This developmental research developed and evaluated an e-module for Grade 11 numeracy using the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model. The analysis phase used Enhanced Regional Unified Numeracy Test (ERUNT) results from 882 Grade 11 learners in a large public high school in the Schools Division of Iloilo, while the targeted implementation and learner evaluation involved 41 Technical-Vocational-Livelihood (TVL) learners identified as below proficient. Thirty Academic Track learners participated in pilot testing, 14 experts validated the developed material during development, and 11 teacher-evaluators joined the formal evaluation phase. Data were gathered using ERUNT, learner and expert evaluation questionnaires, and a 10-item open-ended questionnaire on difficulties encountered. Frequency, percentage, rank, mean, and standard deviation were used for quantitative data, while thematic analysis was applied to qualitative responses. ERUNT results showed an overall mean percentage score of 77 for the Academic Track (Proficient) and 54 for the TVL Track (Nearly Proficient). Three recurring difficulties were identified among the targeted below-proficient learners: difficulty comprehending and translating word problems into mathematical expressions, time pressure, and difficulty recalling concepts and operations on integers. Nine e-modules were developed on integers, the four fundamental operations, and word problems involving these operations, using the 5E instructional structure. Experts rated the e-module Highly Acceptable overall (M = 4.95, SD = 0.04), while learners also rated it Highly Acceptable overall (M = 4.52, SD = 0.08). The study concludes that the developed e-module is an acceptable, technology-enhanced numeracy intervention material that can support self-paced learning and targeted remediation for learners with identified numeracy difficulties.

Keywords: *e-module, numeracy, ERUNT, ADDIE model, integer operations, instructional material*

INTRODUCTION

Numeracy is an essential educational outcome because it supports everyday decision-making, problem-solving, participation in further education, and readiness for work. Yet international and Philippine evidence continues to show persistent mathematics difficulties among many learners. UNESCO (2024) has emphasized the scale of the global learning crisis, while the Programme for International Student Assessment continued to report weak mathematics performance among Filipino 15-year-olds in 2022 (Organisation for Economic Co-operation and Development [OECD], 2023). These concerns make school-level diagnostic assessment and targeted intervention especially important.

Within the Philippine K to 12 system, numeracy development is expected to progress from basic number sense toward mathematical reasoning and real-life application. Coben (2020) describes numeracy as a practical capacity to use mathematics in authentic situations, while Cardino and Cruz (2020) emphasize the importance of teaching strategies that address differences in learners' understanding. In senior high school, unresolved weaknesses in integer concepts and basic operations can obstruct more advanced mathematics, particularly when students must translate contextualized word problems into mathematical representations.

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The Enhanced Regional Unified Numeracy Test (ERUNT) provided the diagnostic basis of the study. The test assessed Grade 11 learners through contextualized problems involving the four fundamental operations on integers. The source study identified a particular concern among TVL learners, whose numeracy performance was lower than that of Academic Track learners. Similar track-based differences have been reported by Cababat and Pespeñan (2023) and by Carbonaro (2015), suggesting that curricular orientation, prior preparation, and time devoted to mathematics may shape performance.

Technology-enhanced instructional materials provide one avenue for targeted numeracy support. Electronic modules can combine text, visuals, narration, animation, guided practice, and assessment in a format that allows learners to work at their own pace. The study therefore developed an e-module anchored in developmental research, the ADDIE model, e-learning principles, constructivism, and the 5E instructional cycle. Its objectives were to determine learners' numeracy levels, identify difficulties among below-proficient learners, develop a responsive e-module, and evaluate the acceptability of the resulting material among experts and learners.

Literature Review

Numeracy and Mathematics Proficiency

Numeracy extends beyond computation to the interpretation and use of mathematical information in meaningful contexts. Coben (2020) explains numeracy as mathematics used for practical and social purposes, while Schunk (2012) emphasizes that learning is strengthened when new knowledge is connected to prior understanding. In school mathematics, this means learners must not only remember procedures but also recognize when and how those procedures apply.

Weaknesses in foundational numeracy can create difficulties in later mathematics. Kwakye and Aggrey (2022) note persistent problems in learning integer operations, while Vlassis and Demonty (2022) highlight the conceptual demands associated with negative numbers. Such difficulties are especially important in contextualized assessments, where learners must simultaneously comprehend language, select an operation, and execute a correct procedure.

The present study used ERUNT to identify proficiency levels and learning needs. The diagnostic function of ERUNT aligns with the broader role of assessment in locating learning gaps and guiding intervention. Department of Education (2022) materials similarly emphasize the use of numeracy evidence to support targeted learning recovery and instruction.

Difficulties in Integer Operations and Word Problems

Learners frequently struggle with integer operations because signs, inverse relationships, and symbolic procedures can be conceptually confusing. Sabasaje and Oco (2023) describe fundamental mathematics skills as essential to subsequent performance, while Setyawati and Indiati (2018) identified misconceptions in integer concepts and operations. These difficulties may persist when learners rely on memorized rules without a stable conceptual model.

Word problems add a language-processing demand to mathematical computation. Öztürk et al. (2019) found that reading comprehension is associated with non-routine mathematical problem-solving, demonstrating that successful performance requires understanding both linguistic and mathematical structures. The source study similarly found that learners had difficulty comprehending and translating worded situations into mathematical expressions.

Time pressure can further complicate performance because learners must interpret a problem, recall a rule, and complete calculations within a fixed period. Tamayo (2021) reported factors that predict mathematics performance among K to 12 graduates, while the present study documented direct learner reports that the ERUNT time limit made balancing speed and accuracy difficult. These findings support intervention materials that allow repeated and self-paced practice.

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E-Learning, Constructivism, and Multimedia Design

The study was theoretically anchored in e-learning and constructivist perspectives. David (2015) summarizes multimedia learning principles associated with Mayer, Sweller, and Moreno, emphasizing design strategies that reduce unnecessary cognitive load and support meaningful processing. These principles are relevant to e-modules that combine narration, visuals, animation, text, and learner control.

Constructivism views learners as active builders of meaning rather than passive recipients of information. Ertmer and Newby (1993) distinguish constructivist learning from more transmission-oriented perspectives, while Schunk (2012) explains how learners interpret new experiences through existing knowledge structures. In numeracy instruction, this supports tasks that connect abstract integer rules with visual representations, contextual examples, and active problem-solving.

The source study applied these principles by using a video-based offline e-module with visuals, narration, examples, learner-controlled pacing, and practice activities. This approach is consistent with the goal of making intervention material accessible to learners who require repeated exposure and structured support.

ADDIE and Developmental Research

Developmental research provides an empirical basis for designing, developing, and evaluating instructional products. Richey and Klein (2007) describe developmental research as a systematic examination of development processes and products, while the ADDIE model organizes this work into analysis, design, development, implementation, and evaluation. McGriff (2000) presents ADDIE as a flexible instructional-systems model in which outputs from one phase inform subsequent decisions.

In the present study, analysis began with ERUNT performance and learner difficulties; design translated identified needs into planned content and multimedia features; development involved production and expert validation; implementation exposed the target learners to the material; and evaluation collected structured feedback. This sequence allowed the material to be progressively revised rather than treated as a finished product from the outset.

Purposive sampling was used in phases where particular expertise or learner characteristics were necessary. Patton (2015) explains that purposive sampling is appropriate when participants are selected because they can provide information directly relevant to the phenomenon or product being studied. This principle supported the selection of validators, low-proficiency TVL learners, and teacher-evaluators.

The 5E Instructional Model and E-Module Development

The e-module was organized around the 5E instructional model: Engage, Explore, Explain, Elaborate, and Evaluate. Duran and Duran (2004) describe the 5E cycle as an inquiry-oriented sequence that activates prior knowledge, supports investigation, formalizes concepts, extends understanding, and evaluates learning. The model provides a clear pedagogical structure for digital modules because each phase can be represented through multimedia and interactive tasks.

Prior module-development studies in the source literature support the value of structured instructional materials. Lumabit (2018) developed and evaluated an inquiry-based mathematics module, while Laroza (2015) emphasized the importance of clearly stated objectives in validated instructional materials. Fernandez (2018) likewise reported the value of attractive and comprehensible instructional materials for mathematics learners.

The present study combined ADDIE's development process with the 5E lesson structure. This combination ensured that the product was not only technically produced and validated but also organized around an explicit teaching-learning sequence responsive to the identified numeracy gaps.

Evaluation and Acceptability of Instructional Materials

Instructional materials should be evaluated in terms of objectives, content, organization and presentation, format and design, activities, and assessment. Fraenkel et al. (2011) discuss structured evaluation instruments as useful tools for obtaining systematic judgments, while Cruz (2015) emphasizes the role of assessment information in improving instructional materials.

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The source study collected both expert and learner evaluations. Expert review was necessary to assess content accuracy, pedagogical soundness, technical quality, language, and curricular alignment, while learners provided direct feedback on usability and learning experience. Robles (2009) similarly demonstrated the use of validation criteria in evaluating computer-aided instructional materials.

Combining quantitative ratings with qualitative information strengthened the developmental process. Braun and Clarke (2006) provide a systematic approach to thematic analysis for identifying recurring patterns in qualitative responses, allowing the researcher to move beyond numerical ratings and understand the difficulties that the e-module needed to address.

Conceptual Framework

The study used an Input-Process-Output framework within the ADDIE development model. ERUNT results supplied the diagnostic input, particularly learners' numeracy level and reported difficulties. The process consisted of analysis, design, development, implementation, and evaluation.

The expected output was an enhanced e-module for numeracy. Figure 1 reconstructs the original schematic diagram into a single readable figure while retaining its input, ADDIE process, and output structure.

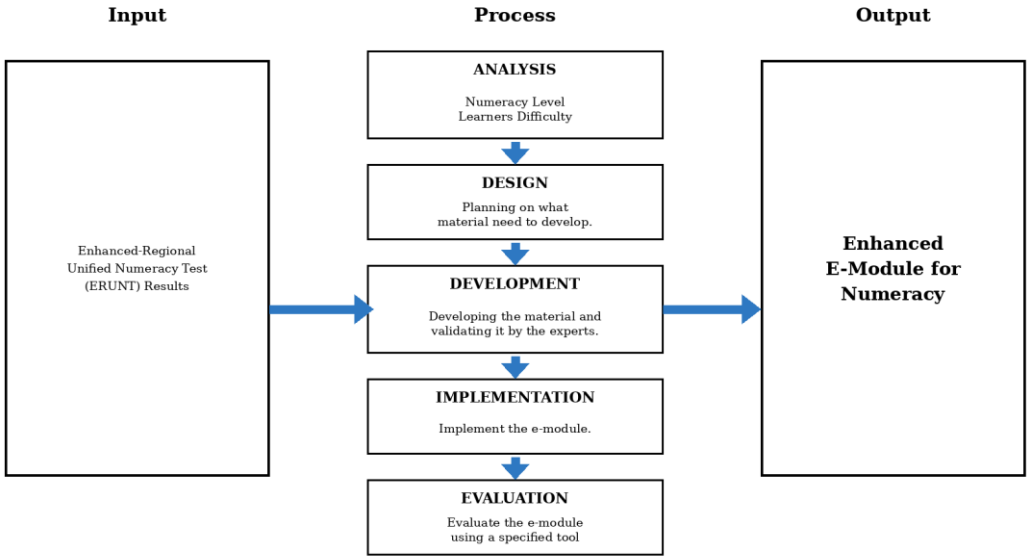

Figure 1. *Schematic Diagram of the Study*

METHODS

Research Design

The study employed a developmental research design using the ADDIE model as its organizing framework. The design was appropriate because the research sought to identify learner needs, create an instructional product, validate and revise the product, implement it with the intended users, and evaluate its acceptability.

Quantitative and qualitative data were used within the developmental process. Quantitative evidence described numeracy proficiency and acceptability ratings, while qualitative evidence explained the difficulties experienced by below-proficient learners.

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Research Locale

The study was conducted in a large public high school in the Schools Division of Iloilo. The school had 4,707 learners during School Year 2023-2024 and provided the context for the ERUNT analysis, e-module pilot testing, implementation, validation, and evaluation.

Participants and Sampling Technique

The analysis phase involved 882 Grade 11 learners who took the ERUNT pre-test. The methods table identified 30 Academic Track learners for pilot testing of the developed material and 41 TVL learners with low ERUNT proficiency for implementation. The same 41 TVL learners subsequently evaluated the e-module.

Purposive sampling was used for the target learner groups and expert participants because specific characteristics were required. Fourteen validators participated during development. In the formal evaluation phase, 11 teacher-evaluators composed of IT, English, and Mathematics teachers evaluated the material in addition to the 41 learner-evaluators.

Research Instrument

Four instruments were used: the Enhanced Regional Unified Numeracy Test (ERUNT), a learners' evaluation questionnaire, an experts' evaluation questionnaire, and a learners' difficulties encountered questionnaire. ERUNT contained 40 contextualized word problems involving integers, with 10 items each for addition, subtraction, multiplication, and division. Scores were converted to mean percentage scores and interpreted using the regional proficiency scale.

The learner evaluation questionnaire contained 20 Likert-type items. The expert evaluation questionnaire, adapted with permission from Divinagracia (2022), contained 30 items covering learning objectives, content, organization and presentation, format and design, learning activities, and assessment. The difficulties questionnaire contained 10 open-ended items and underwent face and content validation.

Data Gathering Procedure

The data-gathering process followed the ADDIE stages. During analysis, permissions and informed consent were secured and the ERUNT pre-test was used to establish numeracy proficiency and identify learners needing intervention. During design, the researcher selected competencies and planned the e-module around identified numeracy weaknesses and the Most Essential Learning Competencies.

During development, an illustrator/animator and recording technician supported production, and validators reviewed the content, language, curricular alignment, technical features, and presentation. The material was revised in response to comments. During implementation, the selected Grade 11 TVL learners used the e-module over six days after parental consent and orientation. During evaluation, learner and teacher/expert feedback was collected through the specified evaluation instruments.

Data Analysis

Quantitative data were analyzed using SPSS version 22. Frequency counts and percentages described proficiency distributions, rank identified least-mastered skills, and means and standard deviations summarized evaluation ratings and overall acceptability.

Qualitative responses were analyzed using thematic analysis following Braun and Clarke (2006). The researcher became familiar with the responses, generated codes, identified recurring patterns, developed themes, and refined the themes to ensure that they represented the learners' reported experiences.

Ethical Consideration

The study observed informed consent, voluntary participation, confidentiality, anonymity, and the right to withdraw. Permission was obtained from school officials, and parental consent was secured for learner participants. Participants were informed of the study's purpose, procedures, and possible risks before participation.

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The researcher protected identifying information and maintained privacy throughout data collection and reporting. Participants were free to refuse to answer questions or discontinue participation without penalty.

RESULTS AND DISCUSSION

Numeracy Proficiency of Grade 11 Learners

ERUNT results showed a clear difference between the Academic and TVL tracks. The Academic Track obtained an overall MPS of 77, interpreted as Proficient. STEM recorded the highest strand MPS at 88, followed by ABM at 78; HUMSS and General Academic Strand obtained 72 and 69, respectively, both interpreted as Nearly Proficient. The TVL Track obtained an overall MPS of 54, interpreted as Nearly Proficient. Industrial Arts obtained 53, Agri-Fishery Arts 54, and Home Economics 55.

Table 1. *Summary of ERUNT Numeracy Proficiency by Track and Strand*

Track / Strand	MPS	Proficiency Level
Academic Track - Overall	77	Proficient
STEM	88	Proficient
ABM	78	Proficient
HUMSS	72	Nearly Proficient
General Academic Strand	69	Nearly Proficient
TVL Track - Overall	54	Nearly Proficient
Industrial Arts	53	Nearly Proficient
Agri-Fishery Arts	54	Nearly Proficient
Home Economics	55	Nearly Proficient

The lower TVL performance is consistent with Cababat and Pespeñan (2023), who reported weaker numerical and analytical proficiency among TVL learners compared with Academic Track learners, and with Carbonaro (2015), who discussed differences in mathematics effort across academic and vocational pathways. These results justified focusing the intervention on TVL learners who were identified as below proficient.

Difficulties Encountered in Answering ERUNT

The qualitative analysis of responses from 41 Grade 11 TVL learners produced three themes: difficulty comprehending and translating word problems into mathematical expressions, time pressure, and difficulty recalling concepts and operations on integers. The first theme reflected problems in understanding problem statements and converting them into equations or expressions. This finding is consistent with the relationship between reading comprehension and mathematical problem-solving reported by Öztürk et al. (2019).

Time pressure reflected learners' concern that the 40-item ERUNT had to be completed within 50 minutes. Learners described difficulty balancing speed and accuracy. The third theme concerned forgotten rules, sign conventions, and concepts related to integer addition, subtraction, multiplication, and division. These experiences are consistent with documented conceptual difficulties involving integer operations (Kwakye & Aggrey, 2022; Vlassis & Demonty, 2022).

Table 2. *Themes on Learners' Difficulties in ERUNT*

Theme	Meaning in the Source Study
Difficulty Comprehending and Translating Word Problems	Learners had difficulty understanding contextualized problems and converting verbal information into mathematical expressions.
Time Pressure	Learners found the 50-minute limit for 40-word problems stressful and difficult for balancing speed and accuracy.
Difficulty Recalling Concepts and Operations on Integers	Learners forgot rules and sign conventions in addition, subtraction, multiplication, and division of integers.

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Development of the E-Module for Numeracy

The ADDIE process produced a nine-module numeracy intervention titled EMONI. The modules covered introduction to integers; addition, subtraction, multiplication, and division of integers; and four modules on solving word problems involving each operation. The content was selected from the identified learning needs and least-learned competencies.

Each module followed the 5E sequence of Engage, Explore, Explain, Elaborate, and Evaluate. The product also incorporated recall activities, learning objectives, examples, visuals, animation, audio narration, exercises, assessment, and references. The use of the 5E structure is consistent with Duran and Duran (2004), while the iterative ADDIE process reflects the development logic described by McGriff (2000) and Richey and Klein (2007).

Table 3. *Nine E-Modules Developed for Numeracy*

Module	Content Focus
1	Introduction to Integers
2	Addition of Integers
3	Subtraction of Integers
4	Multiplication of Integers
5	Division of Integers
6	Word Problems Involving Addition of Integers
7	Word Problems Involving Subtraction of Integers
8	Word Problems Involving Multiplication of Integers
9	Word Problems Involving Division of Integers

Acceptability of the E-Module as Evaluated by Experts

The experts rated every evaluation dimension as Highly Acceptable. Learning objectives, content, and learning activities each obtained M = 4.98 (SD = 0.06). Organization and presentation and format and design each obtained M = 4.93 (SD = 0.12), while assessment obtained M = 4.89 (SD = 0.17). The overall expert rating was M = 4.95 (SD = 0.04), interpreted as Highly Acceptable.

Table 4. *Expert Evaluation of E-Module Acceptability*

Dimension	Mean	SD	Description
Learning Objectives	4.98	0.06	Highly Acceptable
Content	4.98	0.06	Highly Acceptable
Organization and Presentation	4.93	0.12	Highly Acceptable
Format and design	4.93	0.12	Highly Acceptable
Learning Activities	4.98	0.06	Highly Acceptable
Assessment	4.89	0.17	Highly Acceptable
Overall	4.95	0.04	Highly Acceptable

The expert ratings indicate that the material satisfied the source study's standards for objectives, content, instructional organization, presentation, activities, and assessment. This interpretation is consistent with Laroza (2015), who emphasized the importance of clear objectives in validated instructional materials, and with Cruz (2015), who highlighted assessment as a basis for instructional-material improvement.

Acceptability of the E-Module as Evaluated by Learners

The 41 learner-evaluators also rated the e-module positively. Organization and presentation obtained the highest mean at 4.59 (SD = 0.05), followed by learning activities at 4.57 (SD = 0.04). Format and design and assessment each obtained M = 4.51 (SD = 0.07). Learning objectives (M = 4.47, SD = 0.13) and content (M = 4.48, SD = 0.06) were rated Acceptable, while the overall rating was Highly Acceptable at M = 4.52 (SD = 0.08).

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Table 5. *Learner Evaluation of E-Module Acceptability*

Dimension	Mean	SD	Description
Learning Objectives	4.47	0.13	Acceptable
Content	4.48	0.06	Acceptable
Organization and Presentation	4.59	0.05	Highly Acceptable
Format and design	4.51	0.07	Highly Acceptable
Learning Activities	4.57	0.04	Highly Acceptable
Assessment	4.51	0.07	Highly Acceptable
Overall	4.52	0.08	Highly Acceptable

The learner ratings support the usability and suitability of the e-module as an intervention material, particularly its organization, presentation, learning activities, and design. The result is consistent with Lumabit (2018), who found that carefully structured mathematics modules can support performance and critical thinking, and with Fernandez (2018), who emphasized the value of attractive and comprehensible instructional materials. The findings establish acceptability rather than a causal effect on post-intervention achievement, because the source study did not report an experimental pretest-posttest effectiveness comparison.

CONCLUSION

The study demonstrates that numeracy needs among Grade 11 learners can be identified systematically through ERUNT and translated into a targeted instructional product. Academic Track learners obtained a Proficient overall ERUNT rating, whereas TVL learners obtained a Nearly Proficient overall rating, supporting the study's focus on TVL learners who required additional numeracy support.

The targeted learners' difficulties were not limited to computation. They involved comprehension and translation of word problems, time pressure, and recall of integer concepts and operations. These findings indicate that numeracy intervention should address language comprehension, conceptual understanding, procedural fluency, and opportunities for repeated practice.

The ADDIE-guided developmental process produced nine 5E-structured e-modules covering integers, fundamental operations, and related word problems. Both experts and learners judged the material favorably, with overall ratings of Highly Acceptable. The study therefore supports the developed e-module as a usable, technology-enhanced intervention resource for self-paced numeracy learning. Its contribution is the alignment of diagnostic evidence, learner-reported difficulty, instructional design, expert validation, and user evaluation within a single developmental process.

Recommendation

1. School administrators should support the development of instructional materials and provide teacher training on pedagogy, instructional-material design, and technology integration for numeracy intervention.
2. Curriculum planners and instructional leaders should use diagnostic numeracy data such as ERUNT results when determining which competencies require intervention and which digital materials should be developed.
3. Policymakers should review how technology-enhanced instructional materials can address varied learner needs and should provide implementation guidance, infrastructure, and professional-development support.
4. Mathematics teachers are encouraged to create and adapt e-modules that target specific learner difficulties, especially comprehension of word problems, integer concepts, and fundamental operations.
5. Textbook and learning-resource developers may consider pairing print materials with short e-modules or video-based supplementary resources that permit self-paced review and remediation.
6. The developed e-module should be subjected to a subsequent effectiveness study using an appropriate pretest-posttest or quasi-experimental design to determine whether use of the material produces measurable gains in numeracy proficiency.

7. Future researchers should replicate the developmental process in other grade levels, schools, and mathematical competency areas and should examine accessibility for learners with limited internet connectivity or device access.

References

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77-101.

Cababat, J. E., & Pespeñan, R. P. (2023). An assessment of the numerical and analytical skills of Grade 11 senior high school students. Zenodo. https://doi.org/10.5281/zenodo.7808787

Carbonaro, W. (2015). Tracking, students' effort, and academic achievement. Sociology of Education, 78(1), 27-49. https://doi.org/10.1177/003804070507800102

Cardino, J. M., & Cruz, R. A. O. (2020). Understanding of learning styles and teaching strategies towards improving the teaching and learning of mathematics. LUMAT: International Journal on Math, Science and Technology Education, 8(1). https://doi.org/10.31129/lumat.8.1.1348

Coben, D. (2020). Adult numeracy: A review of the literature. National Research and Development Centre for Adult Literacy and Numeracy.

Creswell, J. W. (2014). Research design: Qualitative, quantitative and mixed methods approaches (4th ed.). SAGE Publications.

Cruz, E. D. (2015). Evaluation of worktext in mechanical drafting. Asia Pacific Journal of Multidisciplinary Research, 3(4), 109-117.

David, L. (2015). E-learning theory (Mayer, Sweller, Moreno). Learning Theories. https://learning-theories.com/e-learning-theory-mayer-sweller-moreno.html

Department of Education. (2022). Report on the implementation of K to 12 mathematics curriculum.

Divinagracia, J. (2022). Development for least learned competencies in basic calculus [Unpublished master's thesis]. West Visayas State University.

Duran, L. B., & Duran, E. (2004). The 5E instructional model: A learning cycle approach for inquiry-based science teaching. Science Education Review, 3(2), 49-58.

Ertmer, P. A., & Newby, T. J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. Performance Improvement Quarterly, 6(4), 50-72.

Fernandez, G. M. (2018). Math anxiety and development of an instructional material to improve performance in Mathematics [Unpublished master's thesis]. Aklan State University.

Fraenkel, J., Hyun, H., & Wallen, N. (2011). How to design and evaluate research in education. McGraw-Hill Education.

Kwakye, D. O., & Aggrey, J. (2022). The teaching and learning of integer operations: The case of number rule and conventional method. Journal of Education and Practice, 13(27), 1-15.

Laroza, R. (2015). Validation and effectiveness of modules in personality development and public relations. International Journal of Scientific Research and Publications, 5, 1-8.

Lumabit, A. (2018). Development and evaluation of an inquiry-based learning module for General Mathematics [Unpublished doctoral dissertation]. West Visayas State University.

McGriff, S. J. (2000). Instructional system design (ISD): Using the ADDIE model. Pennsylvania State University.

Organisation for Economic Co-operation and Development. (2023). PISA 2022 results (Volume I): The state of learning and equity in education. OECD Publishing.

Öztürk, M., Akkan, Y., & Kaplan, A. (2019). Reading comprehension, mathematics self-efficacy perception, and mathematics attitude as correlates of students' non-routine mathematics problem-solving skills in Turkey. International Journal of Mathematical Education in Science and Technology, 51(7), 1042-1058. https://doi.org/10.1080/0020739X.2019.1648893

Patton, M. Q. (2015). Qualitative research & evaluation methods: Integrating theory and practice (4th ed.). SAGE Publications.

Richey, R., & Klein, J. (2007). Developmental research methods: Creating knowledge from instructional design and development practice. Journal of Computing in Higher Education, 16(2), 23-38.

Robles, N. T. (2009). The effect of computer-aided instruction on the development of student skills in drafting pattern in Clothing 1 at Pasay City North High School [Unpublished thesis]. Eulogio 'Amang' Rodriguez Institute of Science and Technology.

Sabasaje, S. J., & Oco, R. (2023). Students' mathematical skills and performance. International Journal of Multidisciplinary Research and Publications, 6(2), 328-332.
Schunk, D. H. (2012). Learning theories: An educational perspective (6th ed.). Pearson.
Setyawati, R. D., & Indiati, I. (2018). Analysis of misconceptions of integers in microteaching activities. Journal of Physics: Conference Series, 1013, 012146. https://doi.org/10.1088/1742-6596/1013/1/012146
Tamayo, S. (2021). Predictive factors affecting the mathematics performance of K-12 graduates. International Journal of Arts, Sciences and Education, 2(1), 71-89.
UNESCO. (2024). There is a global learning crisis: Our young people deserve better skills. UNESCO Institute for Statistics.
Vlassis, J., & Demonty, I. (2022). The role of algebraic thinking in dealing with negative numbers. ZDM - Mathematics Education, 54, 1243-1255. https://doi.org/10.1007/s11858-022-01402-1