

Development and Acceptability of Physics Activity Manual for Grade 9 Students

Jerizza B. Samizo

University of Perpetual Help System DALTA, Las Piñas Campus, Philippines

jerizzabsamizo@gmail.com

Date Submitted:
August 27, 2026

Date Accepted:
September 22, 2026

Date Published:
October 14, 2026

DOI:
10.5281/zenodo.23368211

ABSTRACT

This study focused on the development and acceptability of a Physics Activity Manual for Grade 9 students in a laboratory school implementing an institution-based curriculum in Batangas Province. It aimed to identify priority Physics learning areas and associated competencies based on students' assessment results, determine the level of acceptability of the developed manual, examine differences in acceptability ratings when respondents were grouped according to profile variables, and propose enrichments based on the findings. The study employed a descriptive-developmental research design. Assessment results of 75 Grade 9 students from School Year 2024–2025 were analyzed to identify the lowest-performing Physics learning areas and the competencies associated with them, which

served as the basis for developing the manual. The developed material underwent preliminary review by qualified validators and was subsequently evaluated by 30 Science Teachers and 5 Science Experts using an adapted Learning Resource Management and Development System (LRMDS) Evaluation Tool for Printed Resources. Data were analyzed using descriptive and inferential statistics. The manual was rated Highly Acceptable by both groups across Content, Format, Presentation and Organization, and Accuracy and Up-to-Datedness. Overall mean ratings were 3.82 for Science Teachers and 3.70 for Science Experts. Differences were not significant for most profile variables; however, Science Teachers' ratings differed significantly by educational attainment. The findings support the manual's acceptability as a curriculum-aligned supplementary instructional resource, while classroom implementation and effectiveness remain subjects for future research.

Keywords: *Acceptability, Grade 9 Physics, Instructional Material Development, Physics Activity Manual, Priority Physics Competencies*

INTRODUCTION

Science education plays a vital role in developing learners' critical thinking, problem-solving, and scientific literacy skills necessary for national development and global competitiveness. Among the different branches of science, Physics is considered one of the most challenging subjects due to its abstract concepts, mathematical applications, and analytical nature. Many students experience difficulty in understanding Physics concepts, which may result in low academic performance and limited mastery of competencies. This concern highlights the need for instructional materials and learner-centered approaches that are responsive to students' learning needs and can support meaningful engagement in science education.

Globally, the importance of quality science education is emphasized in the United Nations Sustainable Development Goal 4 (Quality Education), which aims to ensure inclusive, equitable, quality education and to promote lifelong learning opportunities for all. In the Philippines, educational reforms

such as AmBisyon Natin 2040 and the recommendations of EDCOM II highlight the need to strengthen foundational learning competencies, improve instructional quality, and provide contextualized learning resources that respond to the actual needs of learners. These initiatives recognize the importance of developing accessible and appropriate instructional materials to support learning, particularly in Science and Mathematics, where students commonly encounter learning difficulties.

Several studies have revealed that students often perceive Physics as difficult due to its complex theories, the mathematical problem-solving demands, and limited opportunities for meaningful hands-on learning. Learners may also struggle to relate Physics concepts to real-life situations, which can contribute to difficulties in mastering learning competencies. Recent educational approaches, therefore, emphasize activity-based, learner-centered instructional materials that provide opportunities for students to engage with concepts. Instructional manuals and activity-based materials can support conceptual understanding, scientific process skills, problem-solving, and independent learning.

In the context of a laboratory school in Batangas Province, the need for contextualized instructional materials is particularly relevant because the institution implements an institution-based curriculum. Consequently, teachers may encounter limitations in finding instructional resources fully aligned with the school's prescribed competencies. Existing learning resources may not fully address the specific curriculum requirements and students' learning needs. This situation underscores the importance of developing instructional materials that align with the institution's curriculum and address areas where learners have difficulty.

Based on the researcher's observations as a teacher, many Grade 9 students have difficulty understanding Physics concepts and applying scientific principles in problem-solving activities. This concern was further supported by the students' performance in written works and classroom assessments. The assessment results for Grade 9 students during School Year 2024–2025 were analyzed to identify the least-mastered learning competencies in Grade 9 Physics. These students were selected as the basis for identifying the least-mastered competencies because they had completed the required Grade 9 Physics lessons and competencies in the school's curriculum. Their assessment results provided the basis for identifying the learning areas in which students performed more poorly.

The identified least mastered competencies then served as the basis for selecting and organizing the content of the Physics Activity Manual. Related competencies were organized into broader Physics topic areas, which became the major units of the manual. The activities were then designed to provide learners with opportunities to observe, investigate, compute, analyze, apply, and reflect on Physics concepts related to the identified competencies. In this way, the manual was developed to directly address the learning areas identified in the students' assessment results while remaining aligned with the institution-based curriculum.

Hence, this study focused on the development and acceptability of a Physics Activity Manual for Grade 9 students. The study sought to develop curriculum-contextualized instructional materials based on the identified least-mastered competencies and to determine their acceptability as evaluated by Science Teachers and Science Experts. The developed manual may serve as a supplementary instructional resource for Grade 9 Physics. It may provide the school with contextualized material that can be further refined, published, and considered for use within the institution, subject to appropriate review and approval.

METHODS

Research Design

This study employed a descriptive-developmental research design. The developmental component involved the development of a Physics Activity Manual for Grade 9 students based on the least-mastered competencies identified through students' written work and assessment results during School Year 2024–2025. The descriptive component focused on determining the acceptability of the developed manual as evaluated by Science Teachers and Science Experts. The study also examined differences in acceptability

ratings according to respondents' profile variables and identified proposed enrichments based on the evaluation findings.

Research Locale

The study was conducted in a laboratory school in Batangas Province that implements an institution-based curriculum. Assessment records from 75 Grade 9 students during School Year 2024–2025 were used to identify priority Physics learning areas. The developed manual was first reviewed by five qualified validators. The final evaluation involved 30 Science Teachers and five Science Experts.

Development of the Physics Activity Manual

Student assessment results were examined to identify the lowest-performing learning areas and associated competencies. These informed the selection and organization of five major topic areas: Kinematics: Motion Along a Straight Line; Dynamics of Uniform Circular Motion; Work, Energy, and Energy Conservation; Simple Harmonic Motion and Elasticity; and Fluid Mechanics. Activities were designed to provide structured opportunities for observation, investigation, computation, analysis, application, and reflection.

Instrument and Data Collection

The manual was evaluated using an adapted Learning Resource Management and Development System (LRMDS) Evaluation Tool for Printed Resources. The tool assessed four dimensions: Content; Format; Presentation and Organization; and Accuracy and Up-to-Datedness of Information. After preliminary validation and refinement, the evaluation instrument was administered to the Science Teacher and Science Expert respondents. Respondent profiles were also collected for the planned subgroup analyses.

Data Analysis

Frequency counts and percentages described respondent profiles. Weighted means and standard deviations summarized acceptability ratings. Independent-samples t-tests were used for profile variables with two categories, including sex and educational attainment among Science Teachers and degree and field of specialization among Science Experts. One-way analysis of variance (ANOVA) was used for Science Teacher age and years of teaching experience. Statistical significance was assessed at $p < .05$. Mean ratings from 3.50 to 4.00 were interpreted as Highly Acceptable.

Ethical Considerations

The study used student assessment results as the basis for selecting instructional priorities and collected evaluation responses from adult professional respondents. Respondent information was handled using coded identifiers in the study's data presentation. The research documentation included ethical clearance and informed consent materials.

RESULTS AND DISCUSSION

Priority Physics Learning Areas

Analysis of the written-work results of 75 Grade 9 students during School Year 2024–2025 identified five priority learning areas used to organize the manual: Kinematics: Motion Along a Straight Line (mean percentage score [MPS] = 58.00); Dynamics of Uniform Circular Motion (MPS = 64.33); Work, Energy, and Energy Conservation (MPS = 59.00); Simple Harmonic Motion and Elasticity (MPS = 44.00); and Fluid Mechanics (MPS = 52.29). Simple Harmonic Motion and Elasticity had the lowest MPS, followed by Fluid Mechanics. These results provided an assessment-based rationale for selecting and organizing the manual's content and activities.

Table 1. *Least Mastered Competencies in Grade 9 General Physics 1 Based on Students' Written Work Results*

Priority learning area	MPS (%)	Performance level
Kinematics: Motion Along a Straight Line	58.00	Average Mastery
Dynamics of Uniform Circular Motion	64.33	Average Mastery
Work, Energy, and Energy Conservation	59.00	Average Mastery
Simple Harmonic Motion and Elasticity	44.00	Average Mastery
Fluid Mechanics	52.29	Average Mastery

Note: Mean Percentage Score (MPS) interpretation: 96–100 = Mastered; 86–95 = Closely Approximal Mastery; 66–85 = Moving Towards Mastery; 35–65 = Average Mastery; 15–34 = Low Mastery; 5–14 = Very Low Mastery; and 0–4 = Absolutely No Mastery.

Acceptability of the Physics Activity Manual

Both respondent groups rated the manual Highly Acceptable across all four evaluation dimensions. For Science Teachers, the overall mean was 3.82 (SD = 0.076), while Science Experts gave an overall mean of 3.70 (SD = 0.047). Among Science Teachers, Accuracy and Up-to-Datedness received the highest dimension mean (M = 3.89), followed by Content and Format (both M = 3.80) and Presentation and Organization (M = 3.79). Among Science Experts, Accuracy and Up-to-Datedness also received the highest mean (M = 3.83), followed by Content (M = 3.77), Format (M = 3.65), and Presentation and Organization (M = 3.56).

Table 2. *Summary of the Level of Acceptability of the Developed Physics Activity Manual as Evaluated by Science Teachers and Science Experts*

Evaluation dimension	Science Teachers		Interpretation	Science Experts		Interpretation
	M	SD		M	SD	
Content	3.80	0.166	Highly Acceptable	3.77	0.163	Highly Acceptable
Format	3.80	0.083	Highly Acceptable	3.65	0.143	Highly Acceptable
Presentation and Organization	3.79	0.196	Highly Acceptable	3.56	0.167	Highly Acceptable
Accuracy and Up-to-Datedness	3.89	0.120	Highly Acceptable	3.83	0.000	Highly Acceptable
Overall	3.82	0.076	Highly Acceptable	3.70	0.047	Highly Acceptable

Note: The weighted mean was interpreted using the following ranges: 3.50–4.00 as Highly Acceptable, 2.50–3.49 as Acceptable, 1.50–2.49 as Moderately Acceptable, and 1.00–1.49 as Not Acceptable.

The results suggest that respondents considered the manual suitable in terms of its instructional content, physical and visual format, organization, and accuracy. The relatively lower mean for Presentation and Organization among Science Experts indicates an opportunity to improve the sequence of information and readability of instructions, even though the dimension remained Highly Acceptable overall.

Differences by Respondent Profile

Among Science Teachers, acceptability ratings did not differ significantly by age ($F = 1.853$, $p = .176$), years of teaching experience ($F = 1.567$, $p = .221$), or sex ($t = 0.363$, $p = .720$). A statistically significant difference was reported by educational attainment ($t = 3.051$, $df = 28$, $p = .005$), with the bachelor's-degree group showing a higher mean rating (M = 3.849) than the bachelor's-degree-with-master's-units group (M = 3.770). Among Science Experts, ratings did not differ significantly by degree or

field of specialization (both $p = .245$). These findings should be interpreted in light of the small expert sample ($n = 5$).

Profile variable	Test statistic	p-value	Result
Science Teachers: age	$F = 1.853$	.176	Not significant
Science Teachers: teaching experience	$F = 1.567$	.221	Not significant
Science Teachers: sex	$t = 0.363$	.720	Not significant
Science Teachers: educational attainment	$t = 3.051$	.005	Significant
Science Experts: degree	$t = -1.440$	.245	Not significant
Science Experts: specialization	$t = 1.440$	.245	Not significant

Note: Significant at $p < .05$

Proposed Enrichments

The evaluation results point to several practical refinements. First, the manual may include activities and reflection tasks that explicitly promote desirable values and traits, such as responsibility, cooperation, perseverance, accuracy, environmental awareness, and appreciation of the practical value of Physics. Second, paper and binding materials may be improved for durability, readability, and repeated classroom use. Third, the flow of information within activities can be strengthened by shortening lengthy sentences, simplifying complex instructions, and improving transitions and subheadings. Finally, an additional technical review of Physics concepts, formulas, computations, units, and sample solutions by qualified Science or Physics experts may help minimize conceptual and computational errors.

These recommendations are consistent with the study's developmental purpose: a generally favorable acceptability rating can coexist with specific indicators that deserve refinement. The results support further review and possible classroom use subject to institutional approval, but do not establish instructional effectiveness.

CONCLUSION

The study developed a Physics Activity Manual for Grade 9 students using assessment results to identify priority learning areas and associated competencies. Evaluation by 30 Science Teachers and five Science Experts found the manual Highly Acceptable in Content, Format, Presentation and Organization, and Accuracy and Up-to-Datedness. Most comparisons across respondent profile variables were not statistically significant, although Science Teachers' ratings differed significantly by educational attainment. The findings support the manual's acceptability as a supplementary, curriculum-aligned instructional resource within the study's institutional context.

The manual may serve as a supplementary, curriculum-aligned resource for Grade 9 Physics in the study's institutional context. Because the research focused on development and acceptability, future research should implement the manual in classrooms and examine its usability and potential effects on students' conceptual understanding, scientific process skills, and learning outcomes.

REFERENCES

- Abaniel, A. (2021). Enhanced conceptual understanding, 21st century skills and learning attitudes through an open inquiry learning model in physics. *Journal of Technology and Science Education*, 11(1), 30–43.
<https://doi.org/10.3926/jotse.1004>
- Agbunag, M. R. (2022). Contextualized and localized supplementary e-learning materials in Science 8 Physics. *International Journal of Multidisciplinary: Applied Business and Education Research*, 3(11), 2378–2396.
<https://doi.org/10.11594/ijmaber.03.11.22>

- Alstein, P., Krijtenburg-Lewerissa, K., & van Joolingen, W. R. (2021). Teaching and learning special relativity theory in secondary and lower undergraduate education: A literature review. *Physical Review Physics Education Research*, 17(2), Article 023101. <https://doi.org/10.1103/PhysRevPhysEducRes.17.023101>
- Arevalo, C. M. E., Janer, S. S., & Ricafort, J. D. (2023). Development of contextualized strategic intervention materials for Grade-8 Physics. *United International Journal for Research & Technology*, 4(7), 114–118.
- Basilio, C. R., & Sigua, E. M. S. (2022). Development and validation of multimedia-based instructional module in Science 7. *International Research Journal of Science, Technology, Education, and Management*, 2(1), 152–162. <https://doi.org/10.5281/zenodo.6496847>
- Bendanillo, Y. V. (2023). Development and validation of contextualized intervention material in teaching junior high school Physics. *International Journal of Academic Multidisciplinary Research*, 7(7), 40.
- Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education*, 32(3), 347–364. <https://doi.org/10.1007/BF00138871>
- Bogador, C. J., Camara, M. K. G., Matunding, C. G., & Sombria, K. J. F. (2024). Challenges and benefits of inquiry-based learning in Physics. *International Journal of Multidisciplinary: Applied Business and Education Research*, 5(7), 2716–2732. <https://doi.org/10.11594/ijmaber.05.07.26>
- Buar, C. L. (2022). A phenomenological study on the lived experiences of Physics students in laboratory classes. *Universal Journal of Educational Research*, 1(2), 10–18. <https://doi.org/10.5281/zenodo.6939564>
- Camiling, J. E. D. (2026). Development and validation of learning module in teaching Science 10. *International Journal of Education, Research, and Innovation Perspectives*, 2(4), 297–326. <https://doi.org/10.5281/zenodo.19465622>
- Cornejo, M. B. (2022). Students' academic performances and least mastered skills as basis in developing learning modules for General Physics 1. *World Wide Journal of Multidisciplinary Research and Development*, 8(1), 46–57. <https://doi.org/10.17605/OSF.IO/E9QST>
- Department of Education. (2023, April 13). *DepEd, EDCOM II set priority areas to accelerate reforms in basic education*. <https://www.deped.gov.ph>
- Department of Education. (2024, April 27). *DepEd's MATATAG Agenda, BEDP 2030 approved by NEDA Board as national policy and plan for basic education*. <https://www.deped.gov.ph>
- Dominado, N., Bulaun, C. M. P., & Quiambao, C. G. (2023). Development and validation of an interactive e-book in Physics 9. *International Journal of Multidisciplinary: Applied Business and Education Research*, 4(8), 2706–2715. <https://doi.org/10.11594/ijmaber.04.08.03>
- Garcia, M. M. (2025). Contextualized learning exercises for Physics 9 through modular approach. *Psychology and Education: A Multidisciplinary Journal*, 50(2), 198–206. <https://doi.org/10.70838/pemj.500208>
- Gerada, E. P. (2022). Development and evaluation of modules for senior high school Physics teachers. *Central Philippine University Multidisciplinary Research Journal*, 1(1), 53–90.
- Kaye, N. B., & Ogle, J. (2022). Overcoming misconceptions and enhancing students' physical understanding of civil and environmental engineering fluid mechanics. *Physics of Fluids*, 34(4), Article 041801. <https://doi.org/10.1063/5.0083993>
- Kent, K. R., Yadav, L. L., & Rashidah, A. (2026). Diagnosing secondary school students' misconceptions in circular motion using item response curves from the Circular Motion Concept Inventory. *European Journal of Mathematics and Science Education*, 7(1), 27–40. <https://doi.org/10.12973/ejmse.7.1.27>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- Manzano, E. (2023). Validation of instructional module in selected topics in Science, Technology and Society (STS) course. *Psychology and Education: A Multidisciplinary Journal*, 7(2), 106–111. <https://doi.org/10.5281/zenodo.7644662>
- Molina, J. T., & Cadorna, E. A. (2025). Enhancing Filipino students' learning outcomes in Physics using comic-based learning materials. *International Journal of Learning, Teaching and Educational Research*, 24(11), 185–204. <https://doi.org/10.26803/ijlter.24.11.9>
- Mufit, F., & Karzah, K. (2024). Concept understanding and causes of student misconceptions on simple harmonic motion. *JIPF (Jurnal Ilmu Pendidikan Fisika)*, 9(3), 464–473. <https://doi.org/10.26737/jipf.v9i3.5508>
- National Economic and Development Authority. (n.d.). *AmBisyon Natin 2040: The vision*. <https://ambisyon.neda.gov.ph>

- Paulmitan, D. C., & Manceras, A. II S. (2025). Contextualized learning module: Enhancing students' conceptual understanding in Physics. *Journal of Education and Community Development*, 1(1), 1–8.
<https://doi.org/10.5281/zenodo.15468395>
- Piaget, J., & Inhelder, B. (1972). *The psychology of the child*. Basic Books.
- Pingil, N. P. (2022). Development and validation of instructional modules in enhancing the study and thinking skills of learners. *Psychology and Education: A Multidisciplinary Journal*, 3(9), 814–832.
<https://doi.org/10.5281/zenodo.7011370>
- Samsudin, A., Afif, N. F., Nugraha, M. G., Suhandi, A., Fratiwi, N. J., Aminudin, A. H., Adimayuda, R., Linuwih, S., & Coştu, B. (2021). Reconstructing students' misconceptions on work and energy through the PDEODE*E tasks with think-pair-share. *Journal of Turkish Science Education*, 18(1), 118–144.
<https://doi.org/10.36681/tused.2021.56>
- Thacker, B. (2023). Inquiry-based experimental physics: Twenty years of an evidence-based, laboratory-based physics course for algebra-based physics students. *Physical Review Physics Education Research*, 19(2), Article 020116. <https://doi.org/10.1103/PhysRevPhysEducRes.19.020116>
- Uhuad, A. J. (2024). Development and validation of self-learning modules (SLMs) in Grade 9 Physics. *Psychology and Education: A Multidisciplinary Journal*, 22(5), 619–622. <https://doi.org/10.5281/zenodo.12797350>
- United Nations. (n.d.). *Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*. United Nations Sustainable Development Goals. <https://sdgs.un.org/goals/goal4>
- Volfson, A., Eshach, H., & Ben-Abu, Y. (2021). Identifying Physics misconceptions in circular motion concepts among secondary students. *Physical Review Physics Education Research*, 17(1), Article 010112.
<https://doi.org/10.1103/PhysRevPhysEducRes.17.010112>