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Strategic Intervention Materials in General Physics 1 For Stem Students at Tanay District

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ABSTRACT

The objective of the study is to evaluate the effectiveness of the Strategic Intervention Materials in General Physics 1 of STEM students at Tanay District based on the result of their performance before and after exposure to SIM. It utilized experimental design and qualitative analysis. It also used purposive sampling technique. The respondents were Grade 12 students of STEM strand from three (3) Senior High Schools in Tanay, Rizal. Weighted mean, Standard deviation, T-tests, and Qualitative Analysis were used in the study. For the level of performance, a substantial improvement in students' performance from pre-test to post-test across all learning competencies and schools were noted. The overall mean increased from 2.48 (Unsatisfactory) to 3.87 (Very Satisfactory), indicating a marked enhancement in learners' understanding of physics concepts. For the significant difference, the obtained p-value of 0.01 does not exceed 0.05 level of significance implicated that the developed SIM was highly effective in enhancing both conceptual understanding and higher-order thinking skills in physics. Based on the findings, the developed SIM served its purpose in enhancing both conceptual understanding and higher-order thinking skills in physics. It was recommended that the SIM should be regularly reviewed, updated, and contextualized based on the student feedback. For the advocacy plan, encourage to conduct professional development programs and workshops to equip teachers with the skills needed to design, adapt, and effectively implement SIM in their classrooms.

Keywords: *SIM, STEM students, Tanay District*

INTRODUCTION

Education serves as the cornerstone of personal and professional development, equipping individuals with the knowledge, skills, and values needed to thrive in an increasingly complex world. Beyond the mere transfer of knowledge, education fosters critical thinking, problem-solving, and innovation skills that are essential in today's rapidly evolving global landscape. Among core subjects, Science plays a crucial role, serving as the foundation for various careers while developing scientific and analytical skills vital for lifelong learning.

Quality education can achieve when learners are provided with appropriate learning materials suited in their capacities and capabilities and at the same time with presence of committed teachers who will help learners. It is facilitated by the teacher using instructional materials where in tangible materials are provided. Appropriate instructional materials employed to the learners will lead to quality learning, shaping them for better education. Learners can easily learn when they can see, hear, touch, or even manipulate the objects they are studying.

Republic Act. No. 10533, also known as the Enhanced Basic Education Act of 2013, states:

"(a) the curriculum shall be learner-centered, inclusive and developmentally appropriate; (b) The curriculum shall be relevant, responsive and research-based; (c) the curriculum shall be culture-sensitive; (d) The curriculum

shall be contextualized and global; (c) The curriculum shall use pedagogical approaches that are constructivist, inquiry-based, reflective, collaborative and integrative."

The legislation highlights the importance of a curriculum that is learner centered and inclusive, ensuring that educational practices align with the diverse needs of learners and equip them with the skills required to navigate an ever-changing world.

Presidential Decree No. 6A, Sec. 5 emphasizes:

"One of the best educated objectives is to design, utilize, and improve instructional technology and develop or produce textbooks and other instructional materials leading to quality education."

The decree underscores the need to develop high-quality instructional materials that enhance the teaching-learning process, ensuring that educational objectives are met efficiently and effectively. In addition to the above provision mandated by the government that also emphasize in upgrading the quality education is the Enhance basic Education Act of 2013 Section 10.3 expresses as:

"*Production and development of locally produced teaching and learning materials shall be encourage."*

The focus then, is to produce instructional materials locally that will help teachers to become competent, efficient and effective teachers. It stresses the role of the teachers in improving the quality of education in developing and constructing instructional materials such as Strategic Intervention Materials. These materials can elevate the performance of the learners which require a cheaper cost and low maintenance. Since, these materials can be kept and can be brought out inside the cabinet anytime.

Dalay (2025), stated that competency-based instructional materials such as Strategic Intervention Materials are instructional materials meant to re-teach the concept and skills. This is also a material given to learners to help them masters a competency-based skills which they were not able to develop during the regular classroom teaching.

The result of the Learning Outcome Assessment (LOA) as one of the bases for data collection collecting data whether the competencies were achieved by the students of the competencies need an intervention activity.

Harvesting the data from the three (3) Senior High Schools in Tanay, Rizal with offered strand of Science, Technology, Engineering and Mathematics (STEM), it was revealed that one of the specialized subjects of STEM which is General Physics 1 got the lowest LOA result in Week 7-8 First Quarter. The researcher identified most of the non-mastered skills in this area. It may be concluded that one of the factors why MELC in Week 8 got the non-mastered skills results is because of because of the time frame and too many MELCs given in this specialized subject. The other reason is that, since there is a limited time for classroom discussion, the students just watch most of the topics on YouTube and study on their own the given materials (PPT) from the teacher.

To address this issue, the researcher used the developed and validated Strategic Intervention Materials (SIM) in general Physics 1, focusing on lessons from Week 7 and Week 8 of the 1st quarter and used it in all public Senior High Schools in Tanay, Rizal with STEM strand.

Through this study, the researcher seeks to contribute to the on-going efforts to improve the quality of science education and ensure that all learners have the opportunity to reach their full potential.

Innovation, Intervention, and Strategy

Intervention Materials refer to devices used by the teachers a supplement to learning which includes visual written and manipulative devices that provide bases for close interaction between the learner and the subject. Intervention materials stimulate interest, clarify subject matter and increase understanding and motivate learners to learn.

One of the examples of intervention materials is the Strategic Intervention Materials (SIM). According to the study of Jaytee (2021), Strategic Intervention Material that includes enhancement activities or teaching aid introduced into the teaching methods to stimulate the activity of the students and thereby increasing their level of understanding; help them retain or increase their mastery level. Strategic Intervention Materials can either be modular type, computer-aided, and other type of interactive learning activities. Strategic Intervention materials are exclusively designed for those students who are really in need of an intensive learning care of the teachers.

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With the release of DepEd Order No. 39 series of 2012, teachers in the country are encouraged to use Strategic Intervention materials along with tutorials and summer camps or classes to address learning gaps that vary across students and different subject areas. This intervention requires pretest, post-test, and fun leaning activities. The strategic Intervention materials help the learners to develop the competencies that they did not master during regular classes. It can be presented using PowerPoint, printed materials, or computerized activities. The SIM focuses only on one particular competency intended for remediation.

From this, the researcher used the developed and validated Strategic Intervention Materials (SIM) in General Physics 1 and evaluated the performance of the students from different STEM schools in Tanay, Rizal. From the students' performance, this measured the effectiveness of the developed and validated SIM in General Physics 1. The teacher gave the validated pre-test to all STEM students of Tanay Senior High School, Tanay West Integrated National High School and Tanay-Sampaloc Integrated National High School, then afterwards gave the Strategic Intervention Materials in General Physics 1 individually to them. The researcher also instructed all the students even their Physics teacher about the materials. After 1-2 weeks, the teacher gave the post-test to see if the SIM was effective. The result of the school's LOA in Physics can also be a basis for SIMs effectiveness.

Action Research Questions

This main objective of this study is to evaluate the effectiveness of the Strategic Intervention Materials in General Physics 1 of STEM students at Tanay District based on the result of their pretest and post-test.

Specifically, it sought to answer the following questions:

1. What is the level of performance of the STEM students at Tanay District before and after exposure to the Strategic Intervention Materials in General Physics 1 in terms of the Most Essential Learning Competencies:
   1.1 Differentiate center of mass and geometric center;
   1.2 Relate the motion of center of mass of a system to the momentum and net external force acting on the system;
   1.3 Relate the momentum, impulse, force, and time of contact in a system; and
   1.4 Solve problems involving impulse, momentum and momentum-impulse theorem?
2. Is there a significant difference on the level of performance of the STEM students at Tanay District as revealed in the pretest and post-test in terms of the different competencies?
3. What are the comments of STEM students at Tanay District on the Strategic Intervention Materials in General Physics 1?

Action Research Methods

Participants and/or Sources of Data

The researcher used purposive sampling technique in selecting the respondents. Purposive sampling refers to a group of non-probability sampling technique in which units are selected because they have characteristics that is needed to be a sample.

The respondents of the study are Grade 12 students of Science, Technology, Engineering, and Mathematics (STEM) strand of three (3) Senior High Schools in Tanay, Rizal. There were 27 STEM students of Tanay Senior High school, 25 students of Tanay West Integrated National High School and 25 students of Tanay Sampaloc Integrated National High School.

This study utilized the experimental design with pretest and post-test. It used the Strategic Intervention Materials in General Physics 1 as the experimental variable/factor and indicator of the students to further evaluate the effectiveness of the SIM. The effectiveness was measured based on the result of the pretest and post-test. All Grade 12 STEM students from three (3) schools in Tanay District took the pretest to determine their level of performance in the lessons found in weeks 7-8 quarter 1 before exposing them to the developed SIM. Qualitative analysis through Interview was also done to selected students on their comments on the developed SIM.

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The data and information in this study were treated confidentially and secured according to the Data Privacy Act of 2012. In this regard, teachers and parents' consent were asked for the students' participation in the study.

Data Gathering Methods

To assess the quality and instructional value of the assessment used to measure the effectiveness of the developed SIM in General Physics 1, an initial 40-item test was developed and underwent rigorous item analysis to assess its validity and reliability. Through this process, the number of items were refined to 20, resulting in a validated pretest and post-test.

The questions in the pretest and post-test covered the topics from weeks 7-8 of quarter 1 in General Physics 1 with the Least Mastered Skills (LMS) and low Learning Outcome Assessment (LOA) result. There were 5 questions allotted to each competency. The pretest was administered to gauge the learners' initial knowledge and understanding of these competencies before the strategic intervention material was introduced.

Scale	Range	Verbal Interpretation
5	4.20 – 5.00	Outstanding
4	3.40 – 4.19	Very Satisfactory
3	2.60 – 3.39	Satisfactory
2	1.80 – 2.59	Unsatisfactory
1	1.00 – 1.79	Poor

For the level of performance of Grade 12 STEM students to the Strategic Intervention Materials in General Physics 1, 5-point Likert's scale was used. Additionally, the researcher used the scores from the pretest and post-test to determine the level of effectiveness of the SIM and interpret the significant effects of the SIM on the student learning outcomes. Interview and written questions were performed to determine the student's comments on the SIM in General Physics 1.

Data Analysis

To answer the statement of the problem, the following statistical treatments were used:

1. To determine the level of performance of the STEM students in Tanay District in pretest and post-test with respect to the different competencies, mean and standard deviation were used.
2. To determine the significant difference on the level of performance of the STEM students in the pretest and post-test with respect to the different competencies, dependent T-test was used.
3. To determine the comments of the STEM students at Tanay District on the Strategic Intervention Materials in General Physics 1, qualitative analysis was employed.

Discussion of Results and Recommendations or Reflection

A. Discussion of Results

Level of Performance of the STEM students at Tanay District before and after exposure to the Strategic Intervention Materials in General Physics I in terms of the different Most Essential Learning Competencies

Table 1 presents the level of performance of the STEM students at Tanay District before and after exposure to the Strategic Intervention Materials in General Physics 1 in terms of the given most essential learning competencies.

Table 1 below reveals a substantial improvement in students' performance from pre-test to post-test across all learning competencies and schools. The overall mean increased from 2.48 (Unsatisfactory) to 3.87 (Very Satisfactory), indicating a marked enhancement in learners' understanding of physics concepts. Notably, students demonstrated significant gains in higher-order thinking skills, particularly in problem-solving tasks involving center of mass, impulse, and momentum, with some reaching Outstanding performance levels. These findings

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suggest that the instructional intervention was effective in improving both conceptual understanding and application skills in physics.

Table 1. *Level of Performance of the STEM students at Tanay District before and after exposure to the Strategic Intervention Materials in General Physics I in terms of the different Most Essential Learning Competencies*

		PRE-TEST			POST-TEST		
LEARNING COMPETENCIES	SCHOOL	MEAN	SD	VI	MEAN	SD	VI
Differentiate the center of mass and geometric center	TANAY-SAMPALOC INHS	2.92	1.00	Satisfactory	4	0.65	Very Satisfactory
	TANAY SENIOR HS	2.96	0.98	Satisfactory	3.63	1.15	Very Satisfactory
	TANAY WEST INHS	2.88	0.93	Satisfactory	4.04	0.79	Very Satisfactory
Relate the motion of the center of mass of a system to the momentum and net external force acting on the system	TANAY-SAMPALOC INHS	1.32	0.85	Poor	4	0.71	Very Satisfactory
	TANAY SENIOR HS	3.41	1.22	Very Satisfactory	4.04	0.98	Very Satisfactory
	TANAY WEST INHS	1.92	0.95	Unsatisfactory	3.64	0.95	Very Satisfactory
Relate the momentum, impulse, force, and time of contact in a system	TANAY-SAMPALOC INHS	2.36	1.22	Unsatisfactory	3.92	0.86	Very Satisfactory
	TANAY SENIOR HS	2.63	1.01	Satisfactory	3.81	0.79	Very Satisfactory
	TANAY WEST INHS	1.8	1.08	Unsatisfactory	3.64	0.7	Very Satisfactory
Solve problems involving center of mass, impulse, and momentum in contexts such as, but not limited to, rocket motion, vehicle collisions, and ping-pong.	TANAY-SAMPALOC INHS	2.08	1.15	Unsatisfactory	3.76	0.83	Very Satisfactory
	TANAY SENIOR HS	3.74	0.94	Very Satisfactory	4.33	0.96	Outstanding
	TANAY WEST INHS	1.68	0.99	Poor	3.64	0.76	Very Satisfactory
	TOTAL	2.48	1.03	Unsatisfactory	3.87	0.84	Very Satisfactory

This is supported by the study of Dumdumya et al., (2024) entitled "Effect of Strategic Intervention Materials on the Learning Competencies of Learners" that states that the results of the post-test were statistically different from the pre test that concludes that SIM helped improve the test scores of the learners.

Significant differences in the level of performance of the STEM students at Tanay District as revealed in the pretest and post-test in terms of the different Most Essential Learning Competencies

Table 2 below presents the significant difference in the level of performance of the STEM students at Tanay District as revealed in the pretest and post-test in terms of the different Most Essential Learning Competencies

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Table 2. *The significant difference in the level of performance of the respondents as revealed in the pretest and post-test*

Learning Competencies	School																					
	TANAY-SAMPALOC INHS						TANAY SENIOR HS						TANAY WEST INHS									
	PRE-TEST			POST-TEST			PRE-TEST			POST-TEST			PRE-TEST			POST-TEST						
	MEAN	VI	σ2	MEAN	VI	σ2	MEAN	VI	σ2	MEAN	VI	σ2	MEAN	VI	σ2	MEAN	VI	σ2	p	(α)	Ho	VI
Differentiate the center of mass and geometric center	2.92	S	0.99	4	VS	0.42	2.96	S	0.97	3.63	VS	1.3	2.88	S	0.86	4.04	VS	0.62	0.00	0.05	R	S
Relate the motion of the center of mass of a system to the momentum and net external force acting on the system	1.32	P	0.73	4	VS	0.5	3.41	VS	1.48	4.04	VS	1	1.92	U	1.91	3.64	VS	0.91	0.01	0.05	R	S
Relate the momentum, impulse, force, and time of contact in a system	2.36	U	1.49	3.92	VS	0.74	2.63	S	1.01	3.81	VS	0.6	1.8	U	1.17	3.64	VS	0.49	0.01	0.05	R	S
Solve problems involving center of mass, impulse, and momentum in contexts such as, but not limited to, rocket motion, vehicle collisions, and ping-pong.	2.08	U	1.33	3.76	VS	0.69	3.74	VS	0.89	4.33	VS	0.9	1.68	P	0.98	3.64	VS	0.57	0.01	0.05	R	S

Table 2 reveals that there is a significant difference between the pretest and post-test performances of students across all learning competencies, as indicated by p-values less than the 0.05 level of significance. Consequently, the null hypothesis is rejected in all cases. This indicates that the observed improvements in students' understanding on all competencies are not due to chance. Furthermore, the consistent shift from lower performance levels to Very Satisfactory levels across all schools suggests that the instructional intervention was highly effective in enhancing both conceptual understanding and higher-order thinking skills in physics.

This is supported by the study of Limbago et al., (2022) entitled "Effectiveness of strategic intervention material on the learning outcomes of students" that proves that utilization of SIM can help increase the learning outcome of the senior high school students than using conventional/traditional way of teaching.

Comments of STEM students at Tanay District on the Strategic Intervention Materials in General Physics

The Stem students from different schools in Tanay gave their comments regarding the developed Strategic Intervention Materials in Physics 1. They mentioned that the SIM is really helpful, consisting many activities and easy-made experiments. One student commented "Thank you po for this free module, it really helped me studying the lesson and understood it." Another student mentioned that the SIM is very handy and easy to handle.

Overall, the SIM in Physics was really appreciated by all students even Physics teachers, as the SIM served as additional material that served its purpose and contributed in enhancing teaching and learning process.

CONCLUSION

Based on the findings of the study, it was concluded that there is a substantial improvement in students' performance from pretest to post-test across all learning competencies and schools, meaning, the developed Strategic Intervention Materials in General Physics 1 served its purpose n enhancing both conceptual understanding and higher-order thinking skills in physics.

Recommendations

Considering the conclusion drawn, the following are the recommendations:

1. The developed SIM should be regularly reviewed, updated, and contextualized based on student feedback, learning outcomes, and emerging educational practices to maintain its relevance and effectiveness.

2. Other schools should consider adopting and integrating Strategic Intervention Materials across other topics in Physics and potentially in other science subjects to enhance both conceptual understanding and higher-order thinking skills.
3. Teachers are encouraged to combine SIM with other learner-centered approaches such as inquiry-based learning, problem-based learning, and collaborative activities to further enrich student learning experiences.
4. Conduct professional development programs and workshops to equip teachers with the skills needed to design, adapt, and effectively implement SIM in their classrooms.

Action Plan

This action plan outlines practical steps to ensure the effective adoption, implementation, and continuous improvement of Strategic Intervention Materials (SIM) in General Physics 1 based on the positive findings.

Objective	Activities/Strategies	Persons Responsible	Timeline	Resources Needed	Success Indicators
Disseminate the findings of the study	Present results in faculty meetings	Researcher and School Head	Mar-26	Presentation materials, reports	Increased teacher awareness and interest in developing SIM
Train teachers on schools in using SIM	Conduct workshops or seminars on designing and implementing SIM	Master Teachers, Subject Group Head	May-26	Training modules, sample SIMs	Teachers demonstrate ability to use/create SIM
Integrate SIM in lesson plan	Incorporate SIM in lesson plans for identified competencies	Subject Teachers	May - June 2026	Developed SIM, lesson guides	Improved student engagement and participation
Sustain and Institutionalize SIM in school	Include SIM in curriculum planning	School Administration	Jun-26	Administrative support, budget allocation	Long-term integration of SIM in teaching practice

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