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Research Article

The Use of Frozen Theme Strategic Intervention Material to Improve the Uniformly Accelerated Motion Proficiency of Grade 9 Students

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ABSTRACT

This study aimed to determine the used of Frozen Theme Strategic Intervention Material in improving the uniformly accelerated motion (UAM) proficiency of grade nine students at Jesus F. Magsaysay Technical Vocational High School. The study used quasi-experimental research method which involved fourthy five students in the control group and fourthy five in the experimental group. The control group was taught using the traditional method of instruction (TMI) while the experimental group was taught using the Frozen Theme Strategic Intervention Material (FT-SIM). A fifty-item conceptual test and the UAM Learning Strategies questionnaire were the tools used in the study.

The study revealed that a typical Grade nine student is aged fourteen and male. Prior to the treatment, the Grade nine students in both the control and experimental groups were performing Fairly Satisfactory in terms of level of proficiency. After the treatment, the students' proficiency on UAM in the experimental group had improved to Very Satisfactory while the control group remained to be in the Fairly Satisfactory level. There is a significant difference in the level of proficiency of science students in the experimental group and no significant difference was noted in the control group. Both the control and experimental groups rarely practice the learning strategies in the uniformly accelerated motion (UAM), hence, the strategic intervention material was developed. The content teachers evaluated the instructional material as very useful.

Keywords*: Frozen theme strategic intervention material, K-12 curriculum program, Perspective, Project FIERCE, Research subject*

Introduction

According to Basic Education Curriculum Primer (2002), to become globally competitive, we must educate our Filipino learners to filter information critically, seek credible sources of knowledge, and use data and facts creatively so

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that they can survive, overcome poverty, raise their personal and national self-esteem, and realize a gracious life in this risky new world. But with the problems persisting today in the Philippine education system, our stand for functional literacy to empower learners is at stake. The trends in science survey alone which was conducted five years ago revealed unsatisfactory result, the Philippines ranked 42nd and 41st in Mathematics out of 45 countries that are tested. According to Navarro et al. (2005), Business Mirror of ABS CBN News, Philippine Education ranks a poor seventh among nine Southeast Asian nations in education and innovation.

Thus, changing the curriculum into K to 12 doesn't stop the crisis, Students must be provided with maximum opportunities to become functionally literate in science. They must be prevented from having any stigma of their weak performance. Therefore, it is the duty of those who must know if the students are learning what they ought to learn and whether those things they consider important enough to be learned make a difference. It cannot be denied that Science subject is also in line with Mathematics and English. However, many students still have problems in solving basic mathematical equations and reading. Thus, most of students find difficulties in science subject most particularly when it comes with scientific computations. For student at Jesus F. Magsaysay Technical Vocational High School, they have low performance in science as well as in Mathematics and English. Some teachers have observed this, that they have difficulties in reading and computations.

It is for this reasons that the researcher embarks on the use of frozen theme strategic intervention material in Physics that will enhance learning and remedy the least mastered skills of the students in uniformly accelerated motion if found to be low.

Methods

The major aim of this study is to determine the used of Frozen Theme Strategic Intervention Material in improving the Uniformly Accelerated Motion Proficiency of Grade Nine Students at Jesus F. Magsaysay Technical Vocational High School.

Specifically, the following questions were answered:

1. How are the students be described on the following profile:
   1.1. Age; and
   1.2. Sex?
2. What is the proficiency level of the students in Uniformly Accelerated Motion of the control and experimental group before the treatment?
3. What is the proficiency level of the students in Uniformly Accelerated Motion of the control group after using the traditional method of instruction and of the experimental group after using the Frozen Theme Strategic Intervention Material?
4. Is there a significant difference in the proficiency level of the students before and after the treatment in the control and experimental group?
5. How is the usefulness of the frozen theme strategic intervention material be described as to the following:
   5.1. Goals and Rationale;
   5.2. Input;
   5.3. Activities; and
   5.4. Evaluation?

Result and Discussion

This section encompasses the results and investigation of the study. It presents the results pertaining to the proficiency on uniformly accelerated motion of Grade Nine students using a frozen theme strategic intervention material at Jesus F. Magsaysay Technical Vocational High School.

Profile of the Participants

Table 2 shows the profile of the Grade 9 students in terms of age and sex.

Table 2. Students' Profile

Profile	Frequency	Percent
Age		
13	14	15.56
14	46	51.11
15	18	20.00
16	8	8.89
17 - above	4	4.44
Total	**90**	**100.0**
Sex		
Male	48	53.33
Female	42	46.67
Total	**90**	**100.0**

Age. Half of the respondents are aged 14 with 46 students (51.11%) followed by 15 years old (18, 20.00%) while 4 students (4.44%) are aged 17 and above. This implies that majority of the Grade 9 students are in the mid-adolescence years and have appropriate ages for the grade level.

Sex. As shown from the table, there are slightly more male respondents (48 or 53.33%) than females (42 or 46.67%). This implies that the student distribution by sex in both classes are almost equal.

Students' Level of Proficiency on Uniformly Accelerated Motion before the Treatment

The results of the pre-test determined the level of proficiency of the students in the control and experimental group prior to the infusion of the Frozen Theme Strategic Intervention Material (Table 3).

Table 3. Level of Proficiency of Students before the Treatment

Pre-Test Scores	Control Group		Experimental Group	
	Frequency	Percent	Frequency	Percent
21-30	7	15.56	7	15.56
11-20	27	60.00	33	73.33
1-10	11	24.44	5	11.11
Total	45	100.0	45	100.0
Average	**14.62 (Fairly Satisfactory) sd = 4.74**		**14.84 (Fairly Satisfactory) sd = 4.59**	

The results of the pre-test of the students in the control group showed that the group belonged to the Fairly Satisfactory level in terms of level of proficiency as revealed by the weighted mean of 14.62 (SD=4.74). The test scores came majority from the bracket of 11 to 20 out of the 50-item Science test with 27 students (60.00%).

Meanwhile, the experimental group yielded a weighted mean of 14.84 (SD=4.59) in the pre-test which is likewise classified as Fairly Satisfactory. Majority of the students got scores within the bracket of 11 to 20 out of the 50-item (33 students, 73.33%).

Before the use of the intervention, the level of proficiency on uniformly accelerated motion of the students is very low as revealed by the weighted mean of both groups. The pretest performance of the experimental group is slightly higher than the performance of the control group.

Tolero & Echaure (2021) suggested that in order to increase student engagement, higher order thinking skills, and achievement, students must be instructed in an inductive process such as the use of strategic intervention material.

Banka et al. (2012) defined Strategic Intervention Material (SIM) as means to re-teach the concepts and skills (least mastered). It is a material given to students to help them master competency – based skills which they were not able to develop during a regular classroom teaching. It consists of both learning strategies (for students) and content enhancement (for teachers). It is a multifaceted approach to help students to become independent and successful learners.

To test if the two groups are homogenous, a Levene's test ofhomogeneity of variances was calculated based on the pretest results of the control and experimental group (Table 4).

Table 4. Levene's test table of homogeneity of variances

Levene Statistic	df1	df2	Sig.
0.471	1	88	0.495
Significant p<0.05		*equal variances are assumed	

The table shows that the Levene statistic is F(1,88) = 0.471, p =0.495. The significant value of 0.495 is greater than 0.05, therefore, it is not statistically significant. It indicates that the assumption of the homogeneity of variances was not violated. Therefore, the two groups are assumed as equal and so the study was carried out.

Students' Level of Proficiency on Uniformly Accelerated Motion after the Treatment

To assess the use of the strategy used by the researcher, a post-test was administered after the application of the Traditional Method of Instruction (TMI) for the control group and the Frozen Theme Strategic Intervention Materials (FT-SIM) for the experimental group (Table 5).

Table 5. Level of Proficiency of Students after the Treatment

Post-Test Scores	Control Group		Experimental Group	
	Frequency	Percent	Frequency	Percent
41-50	0	0.00	2	4.44
31-40	0	0.00	27	60.00
21-30	12	26.67	15	33.33
11-20	18	40.00	1	2.22
1-10	15	33.33	0	0.00
Total	45	100.0	45	100.0
Average	**15.09 (Fairly Satisfactory) sd = 7.14**		**31.64 (Very Satisfactory) sd = 5.36**	

Post-test results showed that none of the class belonged to did not meet expectations level in the experimental group. The bulk of test scores in the post-test of the experimental group was in the bracket of 31 to 40 with 27 students (60.00%). With the weighted mean of 31.64, the experimental group was classified in the Very Satisfactory level after the use of the Frozen Theme Strategic Intervention Material (FT-SIM).

Meanwhile, the bulk of test scores in the post-test of the control group was in the bracket of 11 to 20 with 18 students (40.00%). Still, 15 students (30.33%) belonged to Did Not Meet Expectations level after their exposure in the Traditional Method of Instruction (TMI).

Dahar & Faize (2011) investigated the effect of availability of instructional materials on the academic performance of students in Punjab (Pakistan). He mentioned that instructional materials play a very important role in the teaching - learning process. Population of the study comprised all secondary and higher secondary schools, secondary teachers and secondary students in Punjab. Results revealed that availability of instructional materials has a

strong relationship with academic performance of the students.

Similarly, the study conducted by Padilla et al. (2022) on the Strategic Intervention Material tool to reduce least mastered skills in Grade 4 science, concluded that SIM provides baseline information and should be implemented to avoid marginalization of pupils. Her study also indicated that there is a significant reduction ($p < 0.05$) in the pupil's mean number of least mastered skills after SIM implementation.

The result corroborates the findings of Saglam et al. (2010) that providing students with some formative assessments during the process could help them to better judge their understanding, which, in turn, would result in better student calibration (i.e., students would be more confident in their correct answers, and less confident in their incorrect answers) in UAM.

Difference in the Conceptual Understanding on Matter prior and after the Treatment

To measure the significant difference after the use of the teaching strategy, the mean difference between the scores in pretest and posttest in both the control and experimental groups is presented in Table 6.

Table 6. T-test of the Pretest and Posttest Mean Gain of the Control and Experimental Groups in the Physics Test

Group	Post Test Mean	Pretest Mean	Gain Score	*t*-value	*p*-value	Remarks
Control	15.09	14.62	0.47	0.587	0.560	Not Significant
Experimental	31.64	14.84	16.80	23.234	0.000	Significant

p<.05 **equal variances assumed*

The Grade 9 Science class in the control group obtained a mean gain score of 0.47 from the posttest score of 15.09 and pretest score of 14.62. Using the t-test for paired samples, a t-value of 0.587 was computed and the p-value was 0.560 implying that there is no significant difference in the level of proficiency on uniformly accelerated motion (UAM) of students after the traditional method of instruction (TMI).

Meanwhile, the experimental group yielded a higher gain score of 16.80 from the post-test score of 31.64 and pretest score of 14.84. Using the t-test for paired samples, a t-value of 23.234 was computed and the p-value was 0.000 implying that there is a significant difference in the level of proficiency on UAM of the students after the use of the Frozen Theme Strategic Intervention Materials (FT-SIM).

Banka et al. (2012) defined SIM as instructional materials meant to reteach the concept (s) and skill (s) (least learned) to help the learners master a competency-based skill which they were not able to develop during regular classroom teaching.

Derrida (2010) mentioned that strategic intervention materials were effective in mastering the competency based –skills in chemistry based on the mean gain scores in the posttests of the experimental and control groups. He found out that there was a positive transfer of learning in both groups. However, higher mean was observed from the experimental group after the presentation of the intervention materials. The posttest result of the control group was likewise significant. This suggested that there was significant difference between their mean scores in the posttests in favor of the experimental group.

The findings support previous studies revealed that a strategy like FT-SIM, anchored on inquiry-based and problem-based approaches and is also student-centered, is effective instruction in science education (Chin & Chia, 2004; Lee et al., 2008). The approach assumes that knowledge is actively constructed by learners in a small collaborative group.

The role of the teacher (i.e., the tutor) is to help students learn the cognitive skills needed for problem-solving and collaboration (Evensen et al., 2000; Hmelo-Silver, 2004). Therefore, successful problem solving involves some domain-specific knowledge, the control and monitor of cognitive processes and students'

feelings and interest in the problem (Mayer, 1998).

Table 7 shows the learning strategies employed by the students on Uniformly Accelerated Motion below. In the control group, the students are sometimes fast problem solvers with correct answers (M=3.42; SD=1.08) but also hate computations sometimes (M=3.16; SD=1.26). The students rarely read a word problem more than once before attempting to solve the problem. (M=1.91; SD=1.02) and they rarely learn problem solving best when someone show them the exact way to solve problem (M=1.93; SD=1.01).

Meanwhile, in the experimental group, they sometimes hate computations (M=3.38; SD=1.35); they sometimes have a difficulty in problems which involves addition, subtraction, multiplication and division (M=3.04; SD=1.31); and if they see numbers in the paragraph, they sometimes don't want to solve it anymore because they can't understand the situation in the given problem (M=3.04; SD=1.30). On the other hand, while listening, they rarely pay attention to formulas to understand the problem easier (M=1.62; SD=0.65) and when learning uniformly accelerated motion they rarely need to remember the units of measurements to help them determine the given in the problem (M=1.62; SD=0.65).

Usefulness of the Frozen Theme Strategic Intervention Material (FT-SIM)

Table 7 shows the strategic intervention material's usefulness based on the content teachers' evaluation.

As shown from the table, the content teachers rated the intervention material as "Very Useful" as revealed by the overall weighted mean of 4.73 (SD=0.45).

In particular, the content teachers rated the instructional material's sub-indicators as "Very Useful" which include the input (M=4.90; SD=0.31); the goals and rationale (M=4.88, SD=0.33); and the activities (M=4.83, SD=0.34). Meanwhile, the evaluation was rated to be "Useful" (M=4.3, SD=0.45).

Since, Science has a rapidly changing knowledge base and expanding relevance to society. Teachers must pursue opportunities to build their understanding of how students with varied interests, abilities, and experiences can be supported and guided. Subsequently, students may be able to make sense clearly out of scientific ideas. These ideas can be linked to real-life situations.

This is congruent to the previous study on material development. Based on Nunan's (2008) suggestions, good materials should (1) be clearly linked to the curriculum they serve; (2) be authentic in terms of text and task; (3) stimulate interaction; (4) allow learners to focus on formal aspect of the language; (5) encourage learners to develop skills in learning–how-to-learn; (6) encourage learners to apply their developing language skills to the world beyond the classroom.

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