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Research Article

Development and Validation of Teacher Made Science Workbook of Grade 8 Students in the Philippines

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ABSTRACT

Science teaching in the 21st century society is a challenge but with the aid of effective and appropriate instructional materials, student learning is enhanced. This descriptive research sought to test and validate the teacher-made Science workbook in Grade 8. The quasi-experimental method of research was utilized in the study. Quasi-experimental test causal relationships, much like true experimental designs. A conceptual test in Science was used to assess the level of proficiency of students and served as the basis for the development of the instructional material. Meanwhile, a researcher-made evaluation tool was used to assess the developed material's usefulness.

Results revealed that the students' performance in Science before the use of the teacher-made workbook is Fairly Satisfactory based on the pretest mean. Meanwhile, their performance in Science after the use of the teacher-made workbook is Very Satisfactory based on the post-test mean. According to the findings, there is a substantial difference in students' Science performance before and after using the teacher-made Science workbook. Similarly, the second quarter academic grades and pretest scores have a low positive significant link, while the third quarter academic grades and post-test scores have a negligible negative significant relationship. The study recommends that performance tasks, written works, and quarterly exam, may be considered as variables of academic performance in further investigation. The developed workbook can be used by Grade 8 Science teachers to enhance students' performance in the subject and can be a good tool in developing students' scientific literacy. The teacher-made Grade 8 Science workbook can also be used by teachers as a supplementary material in the K to 12 Curriculum.

Keywords: *instructional material; material development; science workbook; science education; science workbook development.*

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Introduction

Science let the students explore their world and discover new things. It is an interesting and fascinating subject, containing activities such as hands-on labs and experiments. In order to make effective decisions in personal, civic and national affairs, the citizen must have some knowledge of the process and product by which he is fed and clothed, entertained and inspired. However, it was observed that students approach this subject with hesitancy and pessimism, and they find it difficult to understand. They lose or never acquire an interest in their studies; as a result, their achievement in science is generally poor.

This can be seen in the low achievement scores of Filipino students. According to the report of the Program for International Student Assessment (PISA) in 2019 by Organization for Economic Cooperation and Development (OECD) the Philippines got a dismal performance in reading, mathematics and science as stated by Reyzio-Cruz (2019) the performance of the Philippines in science is an average of 375 which is lower that the global average of 489 and we ranked second to the last.

While the learners' performance on the 2019 National Achievement Test (NAT) is below average, particularly in Science, Math, and English (Gonzales, 2019). This is a sign of poor scientific achievement.

Teaching of science offers many opportunities on the natural tendency of children to be active, experiencing and manipulating, objects collecting and constructing simple apparatus. So how can Science be taught better in ways more interesting, fascinating, and more relevant to the needs of the students?

Traditionally, Science is being taught using the chalk and board method in which students have less time to acquire the skills necessary in Scientific Method and Critical Thinking. Lecture Method is quite the most convenient method of teaching, and it is possible to be executed in a large number of students at a time and minimal materials are required. However, Lecture Method is largely a one-way process. There is not enough interaction between the students and the teacher that may ignore individual differences.

As argued by Rogayan Jr. & Dollete, (2019) workbook for senior high school science shows a promising usefulness in improving the performance of students. Workbook can help to reinforce reading skills, mathematical skills, and science skills. When teacher utilizes workbook, students become highly encouraged, which results in improving their capabilities like thinking, observation, experimentation, and interpretation. In addition, workbook provides various types of activities like diagram to be labeled, blank spaces, sketches and clipping, suggesting for supplementary work.

It is in this context that the researcher wanted to develop a science workbook that is suitable to the needs of the learner and provides maximum application of the principle on "learning-by-doing" and to evaluate its effectiveness on the academic performance of the students.

Statement of the Problem

The study generally aimed to enhance the scientific knowledge of students in Science 8. Specifically, it seeks answers to the following questions:

1. What is the level of academic performance of students in Science subject?
2. How is the performance of the students in their pre-test in science?
3. What instructional material will be utilized to enhance the performance of the students in Science Subject
4. How is the performance of the students in their post-test in science after the use of workbook?
5. Is there a significant difference between the pre-test and post-test?
6. Is there a significant relationship between the level of academic performance of students in Science and the result of the pre-test and post-test?
7. How is the usefulness of workbook in Science as evaluated by the Science Teachers?

Significance of the Study

Devices whether visual or audio-visual materials are valuable in the teaching – learning process because they stimulate the interests and motivate learners their enthusiasm to learn and to grow. The lecture cum workbook

approach could offer suggestions to make the lessons more interesting and easier to understand. It provides opportunities for the learners to appreciate the role of Science in their day-to-day lives. The study is deemed significant to the following persons:

To the School Administrator. It may open the eyes of the administrators on the importance of teacher made workbook in teaching and discussing lessons to the learners. This could further encourage head of schools to look into the importance of the acquisition and development of these materials.

To Science teachers, this study will be of great help to the teachers in particular. They will be motivated to teach effectively the lessons that are difficult; and this will certainly facilitate the learners' understanding without close supervision of teachers. It will help educators develop a better and effective means of transmitting scientific skills, knowledge and learning to students. It may also encourage them to create science activities based on the needs of the students and the society as a whole.

To the Students, the results of this study will ultimately benefit the students with the use of workbook approach as a medium of instruction, students will be interested to learn and they will pay attention properly throughout the duration of the class, thereby sustaining the learners' interest. It could improve the atmosphere in science classroom by enhancing classroom discussion through drills, exercises and activities.

Finally, to the academic community as a whole, this study may be helpful towards the improvement of curriculum materials and teaching methodologies that are vital to science instruction. This could determine specific activities and projects that they can develop and support for more precise pupils' development and working relationship with the department. Since the researcher seek to help in the improvement of science instruction in the division, the findings shall be of great educational significance and can be utilized to improve and upgrade the educational system of the region and of the country as well.

Scope and Limitation of the Study

This study was limited to testing and evaluation of science workbook in relation to the academic performance in selected topics in Science of grade 8 students. Four (4) sections will be used in the study with a total number of 127 students. The study will be delimited to the topics in the third quarter in Science 8. The results will be measured using the achievement test in Science 8 prepared by the researchers. To evaluate the usefulness of the workbook 15, teachers from grade 8 from various schools will evaluate the workbook through questionnaire.

To have more information regarding the study and for the purpose of enriching its content, some books, internet sources, research and other reading materials which have common bearing on teacher made workbook in science will be considered.

Conceptual Framework

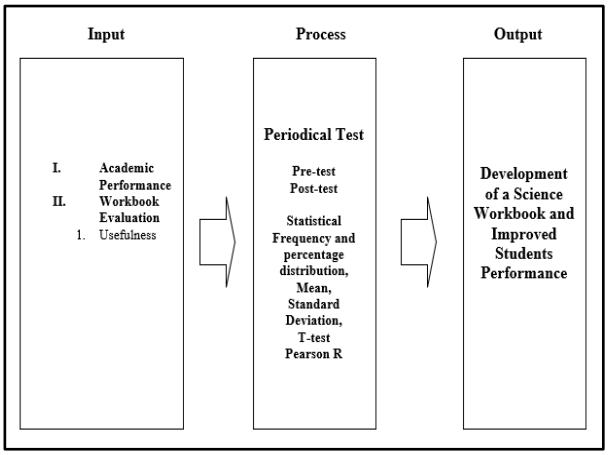

Figure 1. Conceptual Framework

Figure 1 shows the input of the study which includes academic performance of students in the science subject, and results of pre-test and post-test.

The process of the study is the implementation of pre-test and post–test and the statistical treatment of statistical Frequency, percentage Distribution Standard Deviation, Mean T-test and Pearson R.

The output of the study is the development of a science workbook and improved performance of students in Science Grade 8

Methodology

The quasi-experimental method of research was utilized in the study. Quasi-experimental test causal relationships, much like true experimental designs.

A pre-test observation of the dependent variable was made prior to the implementation of the treatment to the selected group; afterwards, the treatment was administered and finally a post-test observation of dependent variable was carried out to assess the effect or treatment on the group.

Respondents

The participants of the study are Grade 8 students from different class in Castillejos National High School.

The names of participants were not revealed to maintain privacy and confidentiality of their responses as per ethics in research explained by Fraenkel (2003 p.58).

Sampling Design

A universal sampling technique was employed. The names of participants were not revealed to maintain privacy and confidentiality as per ethics in research explained by Fraenkel (2003 p.58).

Instruments

The periodical test in science 8 was the main instrument to measure student performance. The instrument consisted of 50 items multiple choices. The scoring was one point for every correct answer and zero point for every wrong answer. The highest total possible score a student can get is 50 points.

Questionnaire were devised for the purpose of the study to measure the usefulness of the developed workbook after the approval of the Schools Division Superintendent.

Data Collection

Pre-Treatment Phase

The researcher prepared immediately the instrument to be used in gathering data for which the construction and validation was already explained. The instrument was pretested to both the lecture cum workbook group and lecture or traditional group at the same time to determine the level of proficiency in science 8. Results on the pretest was collected and treated statistically using t-test for independent samples. This is to make sure that the two groups are equivalent and have an equal chance of receiving knowledge.

Treatment Phase

The workbook was utilized in teaching the topics in science 8 covered during the third grading period of school year 2017-2018. The researcher made it a point that quizzes, assignments, questions, references, and learning conditions were exactly the same for both groups except the use of workbook.

Post Treatment Phase

Following the completion of all topics in the lecture cum workbook group and the traditional way of teaching in the traditional group, the researcher will administer the accomplishment test to both groups at the same time in the final period. The scores was evaluated and compared to determine if there was a significant gain on the scores and to compare the effectiveness of use of workbook on teaching science 8.

Data Analysis

The computer software SPSS version 20 and MS Excel 2013 were used for the processing of data. The statistical tools used in the analysis and interpretation of data and hypotheses testing include the following.

Frequency and Percent Distribution. This was used to calculate the frequency counts of the respondents' test scores and academic grades.

Mean. The average of the responses was calculated using this method. The following rating scale analysis was used to examine the survey questionnaire responses:

Table 1. Rating Scale Analysis of the Evaluation Tool

Arbitrary Values	Statistical Limits	Symbol	Verbal Description
5	4.50-5.00	SA	Strongly Agree
4	3.50-4.49	A	Agree
3	2.50-3.49	MA	Moderately Agree
2	1.50-2.49	D	Disagree
1	1.00-1.49	SD	Strongly Disagree

Table 2. Academic Grade and Test Score Interpretation

Academic Grades	Test Scores	Symbol	Verbal Description
90-100	41-50	O	Outstanding
85-89	31-40	VS	Very Satisfactory
80-84	21-30	S	Satisfactory
75-79	11-20	FS	Fairly Satisfactory
Below 75	1-10	DNM	Did Not Meet Expectations

Standard Deviation. Using the mean as the measure of center, the spread of how far the observations are from the mean was determined.

T-test for Paired Samples. This was used to get the significant difference between the pre-test and post-test results.

Pearson r Correlation Analysis. This was used to investigate the correlation (r) of the academic grades and test scores.

Table 3. Qualitative Interpretation of the Computed Pearson Correlation Coefficient r

Pearson Correlation Coefficient	Verbal Interpretation
±0.81 to ±1.00	Very High Correlation
±0.61 to ±0.80	High Correlation
±0.41 to ±0.60	Moderate Correlation
±0.21 to ±0.40	Low Correlation
0.00 to ±0.20	Negligible Correlation

Result and Discussion

This section encompasses the results and investigation of the study. It presents the data pertaining to the testing and validity of the teacher-made Science workbook for Grade 8 students.

Level of Academic Performance of the Students in Science Subject

Table 4 shows the academic performance of the students in Science subject during the second and third quarter.

Table 4. Level of Academic Performance of Science Students In Second and Third Quarter

Grading Scale	Second Quarter		Third Quarter	
	Frequency	*Percent*	*Frequency*	*Percent*
90-100	25	19.69	34	26.77
85-89	23	18.11	26	20.47
80-84	30	23.62	34	26.77
75-79	44	34.65	29	22.83
Below 75	5	3.94	4	3.15
Total	127	100.0	127	100.0
General Average	82.44 (S)		84.57 (VS)	
Standard Deviation	6.59		7.34	

Legend: 90-100 (Outstanding); 85-89 (Very Satisfactory); 80-84 (Satisfactory); 75-79 (Fairly Satisfactory); Below 75 (Did Not Meet Expectations)

As seen on the table, the overall academic performance of the students in Science subject during the second quarter is 82.44 (SD=6.59) which is described as Satisfactory.

In particular, there were 44 (34.65%) students who belong to Fairly Satisfactory level, and 30 (23.62%) students are in satisfactory level. Few (5, 3.94%) students who did not meet expectations level. This indicates that the students' overall academic achievement in Science was average prior to the use of the teacher-created workbook.

On the other hand, the overall academic performance of the students in science subject during the third quarter is 84.57 (sd=7.34) which is described as Very Satisfactory.

It is quite clear that the highest percent of students belong to outstanding level with 34 students (26.77%) based on their academic grades in Science during the third quarter. A total of 34 (26.77%) students belong to Satisfactory level while few (4, 3.15%) students who did not meet expectations level. This suggests that the students' academic performance increased to above average after they have utilized the teacher-made workbook.

Level of Performance of Students in Science before the use of the Teacher-Made Workbook

The level of students' performance in Science prior to using the teacher-made workbook was determined by pre-test results (Table 5).

Table 5. Descriptive Statistics of Students' Pre-test Scores

Pretest Scores	Frequency	Percent	Verbal Description
41-50	0	0	Outstanding
31-40	0	0	Very Satisfactory
21-30	33	25.98	Satisfactory
11-20	86	67.72	Fairly Satisfactory
1-10	8	6.30	Did Not Meet Expectations
Total	127	100.0	M = 17.55 (Fairly Satisfactory) SD = 4.78

As indicated in the table, the students' pretest results revealed that the class performed at a Fairly Satisfactory level in Science, as evidenced by the weighted mean of 17.55 (SD=4.78). With 86 students, the majority of the test results ranged from 11 to 20 on the 50-item conceptual test (67.72 percent). This indicates that before using the teacher-made workbook, the majority of Grade 8 students do fairly in Science.

A total of 33 (25.98%) students are performing satisfactorily in science and few students belong to the Did Not Meet Expectations level (8, 6.30%). It can be noted that none of the students belong to the Very Satisfactory and Outstanding levels prior to the intervention.

Instructional Material to be utilized to Enhance Students' Scientific Knowledge

Students' scientific understanding is enhanced by using the Science Workbook for Grade 8, which focuses on matter and covers topics such as the atom, the periodic table of elements, phase transitions, and matter classification.

The ADDIE (Analysis, Design, Development, Implement, and Evaluate) instructional design is used to create the teacher-made instructional materials.

ADDIE made her debut in 1975. The Center for Educational Technology at Florida State University created it for the US Army, and it was soon adopted by all of the US Armed Forces. The five phases were based on the Five Step Approach, a previous ISD (Instructional Systems Development) paradigm developed by the US Air Force in 1970. It also shares a lot of similarities with Bela Banathy's design (ADDIE Timeline, 2010).

The ADDIE model is a generic technique that instructional designers and training developers have historically employed. The five

phases—Analysis, Design, Development, Implementation, and Evaluation—represent a dynamic and adaptable framework for developing successful training and performance support systems. While the ADDIE model is likely the most widely used, it has a number of flaws that have resulted in a number of spin-offs or variants (Instructional Design, 2018).

The instructional problem is clarified during the analysis phase, as are the instructional goals and objectives, as well as the learning environment and the learner's previous knowledge and skills. Learning objectives, assessment tools, activities, content, subject matter analysis, lesson planning, and media selection are all part of the design phase. The planning stage should be methodical and precise. A logical, ordered technique of defining, developing, and assessing a set of planned strategies aimed at achieving the project's goals is referred to as systematic. Specific indicates that each piece of the instructional design strategy must be carried out with great care (Instructional Design, 2018).

The developers build and compile the content assets that were created in the design phase during the development phase. Programmers are responsible for developing and/or integrating new technologies. Debugging techniques are carried out by testers. According to any feedback received, the project is assessed and revised. A procedure for training the facilitators and learners is designed during the implementation phase. The course curriculum, learning outcomes, delivery style, and testing procedures should all be covered in the facilitators' training. Training on new tools (software or hardware) and student registration are all part of the learners' preparation. The project manager also ensures that the books, hands-on equipment, tools, CD-ROMs, and software are in place, as well as ensuring the learning application or Web site is operational during this period (Instructional Design, 2018).

The evaluation phase consists of two parts: formative and summative. Formative evaluation is present in each stage of the ADDIE process. Summative evaluation consists of tests designed for domain specific criterion-related referenced items and providing opportunities for feedback from the users.

The researchers developed the IM which contains several parts as indicated below (Table 6).

Table 6. Parts of the Teacher-Made Science Workbook

Parts of the Workbook	Description
Activity Number	Part of the instructional material which indicates the chronological sequence of the worksheets in the workbook.
Title	Part of the worksheet which briefly describes the content of the worksheet.
Objectives	Part of the worksheet which outlines the learning outcomes that the students must attain in each of the worksheet in the workbook.
Concepts	Part of the material which provides the overview of the concepts to be learned and enhanced in each worksheet.
Exercises	Provides varied activities designed to enhance students' scientific knowledge on matter.
Segment Reference Links	Part of the instructional materials which provides sources of information that the teacher used in the development of the workbook.

Formative evaluation occurs at every stage of the ADDIE process. This is a multifaceted—and crucial—aspect of the ADDIE process. With the help of the instructor and the students, evaluation is carried out throughout the implementation phase. A summative evaluation is conducted for instructional improvement after a course or program has been implemented. During the evaluation phase, the designer should check to see if any difficulties with the training program have been resolved, and if the targeted objectives have been met (Kurt, 2018).

Level of Performance of Students in Science after the use of the Teacher-Made Workbook

The class's level of Science performance was determined after they were exposed to the teacher-created Science workbook. The descriptive statistics of the students' posttest scores are shown in Table 7.

Table 7. Descriptive Statistics of Students' Post-test Scores

Post-test Scores	Frequency	Percent	Verbal Description
41-50	60	47.24	Outstanding
31-40	57	44.88	Very Satisfactory
21-30	10	7.87	Satisfactory
11-20	0	0	Fairly Satisfactory
1-10	0	0	Did Not Meet Expectations
Total	127	100.0	M = 38.81 (Very Satisfactory) SD = 6.45

The weighted mean of 38.81 (SD=6.45) in the post-test result of students suggested that the courses had improved to Very Satisfactory in terms of Science performance, as shown in the table. The test results ranged from 41 to 50 on a 50-item achievement exam, with 60 students (47.24 percent) scoring in this range. This indicates that many students performed Outstanding in their Science performance.

Almost half of the class (57, 44.88%) belong to the Very Satisfactory level and few (10, 7.87%) are performing Satisfactory. Furthermore, after the intervention, none of the students fell into the Did Not Meet Expectations or Fairly Satisfactory levels. The standard deviation of 6.45 in the post-test means that the students had less consistent scores compared to the pre-test. It implies that the sores are more spread out from the mean implying the heterogeneity of the class after the intervention. Meanwhile, the weighted mean shows that there is an improvement in the Science performance of the students after their exposure to the teacher-made workbook.

To easily see the improvement of the students' Science performance, the results of the students' pre-test and post-test were compared in Table 8.

Table 8. Descriptive Statistics of Students' Pre-test and Post-test Scores

Scores	Verbal Description	Pretest		Post-test	
		Frequency (n=127)	Percent (100.0)	Frequency (n=127)	Percent (100.0)
41-50	Outstanding	0	0.00	60	47.24
31-40	Very Satisfactory	0	0.00	57	44.88
21-30	Satisfactory	33	25.98	10	7.87
11-20	Fairly Satisfactory	86	67.72	0	0.00
1-10	Did Not Meet Expectations	8	6.30	0	0.00
	Weighted Mean	17.55 (Fairly Satisfactory)		38.81 (Very Satisfactory)	
	SD	4.78		6.45	

It was noticed that after using the teacher-made workbook, the students' Science performance improved. The conceptual test's mean increased from 17.55 to 38.81, resulting in a gain score of 21.26.

It can be noted that from eight (6.30%) students in the pretest, none belongs to the Did Not Meet Expectations level after the intervention. In addition, no one belongs to the Fairly Satisfactory level after using the workbook, despite the fact that 86 (67.72) students did so on

the pretest. In comparison to the 33 (25.98%) students in the pre-intervention group, 10 (7.87%) students scored at the satisfactory level. According to the post-test results, nearly half of the class scored Very Satisfactory (57, 44.88 percent) or Outstanding (60, 47.24 percent). As indicated in the comparison table, the majority of students improved their scientific performance by using the teacher-created workbook.

Difference in the Students' Performance in Science before and after the use of the Teacher-Made Workbook

A t-test for paired samples is shown in Table 9 to measure the significant difference in the students' performance before and after the use of the teacher-made Science workbook.

Table 9. Paired Samples T-test of the Pretest and Posttest Scores in the Science Conceptual Test of Grade 8 Students

Science Conceptual Test	N	Mean	SD	Gain Score	*t*-value	*p*-value	Remarks
Pretest	127	17.55	4.78	21.26	27.213	0.000	Significant
Post-test	127	38.81	6.45				

Significant at p<0.05

**equal variances assumed*

The class received an overall gain score of 21.26 using the t-test for paired samples, based on the pretest and post-test mean values of 17.55 and 38.81, respectively. The computed t-value was 27.213, with a p-value of 0.000. This indicates that there is a substantial difference in students' Science performance before and after exposure to the teacher-created Science workbook. The results show that the pupils' performance improved significantly following the intervention.

Relationship between the Level of Academic Performance of Students in Science and the Results of the Pretest and Post-test

Table 10 shows the relationship between the students' academic performance in Science and the results of the pretest and post-test.

Table 10. Relationship between Students' Academic Performance in Science and Results of the Pretest and Post-test

Aspect	N	Pearson r	p-value	Decision
Second Quarter Academic Grades and Pre-test Scores	127	0.404**	0.000	Negligible Correlation
Third Quarter Academic Grades and Post-test Scores	127	-0.182*	0.041	Moderate Correlation

***Correlation is significant at the 0.01 level (2-tailed)*

**Correlation is significant at the 0.05 level (2-tailed)*

It is evident from the table that there is a low positive and significant relationship between the second quarter academic grades and pretest scores (r=0.404; p=0.000) which implies that as the quarter grades increase, the pretest scores will also tend to increase. However, it is found that the third quarter academic grades is significantly inversely related to post-test scores (r=-0.182, p=0.041). It suggests that although it is negligible, as the third quarter academic grades increase, the post-test scores tend to decrease. This might be due to the homogeneity of the class specifically the low performers.

Usefulness of the Teacher-Made Science Workbook as Evaluated by Science Teachers

Table 11 shows the usefulness of the Science workbook as rated by Science content teachers.

Table 11. Science Teachers' Evaluation on the Usefulness of the Teacher-made Workbook

Indicators	Mean	SD	VD
1. The workbook task is relevant and consistent to the lesson.	4.73	0.46	SA
2. It provide a systematic review of what has already been taught.	4.73	0.46	SA
3. It reflects the most important aspects of what is being taught in the lesson.	4.87	0.35	SA
4. It is grammatically correct	4.80	0.41	SA
5. The language used is consistent with that used in the rest of the lesson and in the rest of the workbook.	4.60	0.51	SA
6. The instructions are clear and easy to follow.	4.73	0.46	SA
7. It contains important concepts where students learn something.	4.67	0.49	SA
8. It requires students to make discrimination and provided by number of task that provide practice on the components of the discrimination.	4.73	0.46	SA
9. The content of the workbook is accurate and precise.	4.67	0.49	SA
10. Response modes are consistent from task to task.	4.80	0.41	SA
11. Instructional design of individual task are carefully planned.	4.73	0.46	SA
Overall	4.73	0.44	SA

Legend: SA-Strongly Agree (4.50-5.00); A- Agree (3.50-4.49); MA-Moderately Agree (2.50-3.49); D-Disagree (1.50-2.49); SD-Strongly Disagree (1.00-1.49)

As reflected from the table, the Science content teachers 'Strongly Agree" on the usefulness of the teacher-made workbook as revealed by the overall weighted mean of 4.73 (SD=0.44).

In particular, the Science teachers "strongly agree" that the developed workbook reflects the most important aspects of what is being taught in the lesson (4.87). The teachers also "strongly agree" that science workbook is grammatically correct (4.80) and the response modes are consistent from task to task (4.80).

Although the indicators are all strongly agreed by the raters, the lowest means are found in the following items: the language used is consistent with that used in the rest of the lesson and in the rest of the workbook (4.60), the workbook contains important concepts where students learn something (4.67) and the content of the workbook is accurate and precise (4.67).

Conclusions

From the findings, the following conclusions which are binding on the respondents are arrived at:

1. The students' level of academic performance in Science before the intervention is satisfactory.
2. The performance of the students in Science before the use of the teacher-made workbook is fairly satisfactory.
3. The instructional material catered to the needs of the students.
4. The performance of the students in Science after the utilization of the teacher-made workbook is very satisfactory.
5. There is a significant difference in students' Science performance before and after using the teacher-created Science workbook.
6. There is a low positive significant relationship between the second quarter academic grades and pretest scores and a negligible negative significant relationship between the third quarter academic grades and posttest scores.
7. The developed workbook in Science is useful as evaluated by the content teachers.

Recommendations

The researcher makes the following recommendations based on the data and conclusions.

1. Since academic performance is comprised of several components under the K12 curriculum, these components including the performance tasks, written works, and

quarterly exam, may be considered as variables in further investigation in students' performance.

2. Since the level of performance of the students is fairly satisfactory before the intervention, the researcher may conduct item analysis of the conceptual test to determine the learning domains where the students are weakest. For example, if the students are weakest in remembering, understanding, applying or in the higher order thinking skills.
3. The developed workbook can be used by Grade 8 Science teachers to enhance students' performance in the subject and can be a good tool in developing students' scientific literacy.
4. The teacher-made Grade 8 Science workbook can be used by teachers as a supplementary material in the K12 Curriculum. A development of parallel material in other topics and other grade levels may be done by Science teachers.
5. Future researchers may consider the quasi-experimental research utilizing control and experimental groups to explore more the relationship of students' academic grades and test scores.
6. Future researchers may further explore the validity and acceptability of the developed workbook which involve not only Science teachers but also Science content specialists, instructional material development experts and the Science students.

Parallel study may be conducted to validate the results of the investigation.

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