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Validation and Acceptability of a Guidebook in Writing Investigatory Projects

Victorino V. Butron

MAT Science, School San Juan National High School

Abstract: ***The guidebook in writing investigatory projects is an instructional material used by high school students in preparing a science research paper. The guidebook was subjected to validation and acceptability test by students and experts. The developmental research method, experimental research design in evaluating the developed guidebook and descriptive- evaluative design in the acceptability test of the developed guidebook was utilized in the study. Using a questionnaire checklist, experts and the student users rated the acceptability of the developed guidebook in terms of contents, clarity, appeal to target users, originality, learning activities, applicability/usefulness and format. Findings of this study revealed that students from the exposed and not exposed groups significantly improved their performance based on pretest and posttest. Moreover, students exposed to the developed guidebook achieved a higher mean score in the posttest than the not exposed group. The result of the dependent t- test revealed that there is a significant difference between the pretest and posttest results of the exposed and not exposed groups to the developed guidebook. The developed guidebook was very much accepted in terms of content, clarity, appeal to target user, originality, learning activities, applicability or usefulness and format as evaluated by the two groups of evaluators. The independent t- test revealed that there was no significant difference between the evaluation of the student respondents and experts. The use of the developed guidebook significantly increased the performance of the students. Therefore, the developed Guidebook in Writing Investigatory Projects can be used as an effective instructional material for writing science investigatory projects.***

Keywords: guidebook, investigatory projects, instructional material

1. Introduction

Children learn through doing. As they practice hands-on methods of scientific inquiry, students begin to see the world around them through a lens of inquisitiveness. They learn to experience the world around them through evidence-based data, and what they discover shapes their understanding of that world and their role in it. They become actively engaged— participating, imagining, and creating new solutions and approaches as they grow.

Article XIV of the Philippine Constitution states that, "Science and Technology are essential for national development and progress. The state shall give priority to research and development, invention, innovation and their utilization and to science and technology education, training and services. It shall support indigenous, appropriate and self-reliant scientific and technological capabilities and their application to the country's productive systems of national life." This mandate provides basis on the importance of science fair project in the country. To help the country develop future scientist educators must train students in research and development.

The need for improving science education has been reflected on the lack of quality on the basic science education seen by the low scores of our students in various achievement tests. The passing rate for the national achievement test (NAT) for elementary and high school is below the target passing rate of 75%. According to the survey of Trends in International Mathematics and Science Study (TIMSS), the country ranked 43rd out of 46 nations in terms of secondary science and in 2008.According to UNESCO report of 2010 on the Philippines, there were only 81 researchers in research and development per million in 2009.

As mentioned, it clear defines the need for developing students in science and research. Knowing that science investigatory projects have a big impact on students, schools and the society, there must be means of developing all students in doinginvestigatory projects. According to UN Educational Scientific and Cultural Organization, expenditure of effort should be in the direction of recruiting more youngsters into science and mathematics with consideration given to improve instruction in elementary and secondary schools. This action can be helped along by (1) providing well- trained teachers; (2) good books; (3) proper materials; (4) adequate equipment; (5) the use of techniques based upon scientific principles related to the learning process; and (6) the use of motivation based upon the interest and needs of young people.

This implies that there is a need to develop new materials in teaching science in order to increase the abilities of students in doing science projects. However, not all students in the Philippines have the opportunity to develop their scientific investigatory skills because only a few number of schools are selected to offer research as part of their curriculum. Philippine Science High School, National, Regional and Division science high schools are limited to students who are able to pass their high standards of qualification for admission. These are most of the schools that offer research in their curriculum. As a result, ordinary public national high schools can only teach investigatory projects to students who would be joining competitions in science fairs. Learning resources are also limited since publishers would prefer publishing books for subject areas with greater demands on the market. However this should not be a constraint for teachers from engaging students to conduct investigatory projects, instead they should be encouraged in developing their own instructional material in teaching the subject matter.

San Juan National High School is one of the schools from Rizal province that needs intervention and instructional materials. Most students are not interested in doing SIP because of the lack of knowledge and material for the project. According to the 2015 National Achievement Test result, science subject is one the subjects that achieved the lowest score. In relation to this, if more students could get involved in doing Science Investigatory Projects (SIP) it could develop their interest in science subjects and may give an impact to the results of the National Achievement Test. Since SIP is not a part of their subject, it will be of great help if an instructional material could be developed to help the students make an SIP. Furthermore, an instructional material specifically a guidebook may help students develop scientific skills easily through a step by step procedure to follow.

The researcher having analyzed the problem was able to come up with an idea of developing a guidebook in writing investigatory projects. The guidebook will serve as a key in developing scientific attitudes, skills, thoughts and interests among students not only from San Juan National High School but for the other schools in the division who meet the same problem. The study could also be a start on giving idea to other researchers to develop learning materials for SIP and conduct other studies involving science fair and how it could strengthen students' attitude towards learning science and technology.

2. Related Literatures and Studies

A theory related to the study is the Experiential Learning Theory. "Experiential learning is a philosophy and methodology in which educators purposefully engage with students in direct experience and focused reflection in order to increase knowledge, develop skills, and clarify values", Baporikar (2014).

Experiential learning is also referred to as learning through action, learning by doing, learning through experience, and learning through discovery and exploration.

Unlike traditional classroom situations where students may compete with one another or remain uninvolved or unmotivated and where the instruction is highly structured, students in experiential learning situations cooperate and learn from one another in a more semi-structured approach. Instruction is designed to engage students in direct experiences which are tied to real world problems and situations in which the instructor facilitates rather than directs student progress. The focus of experiential learning is placed on the process of learning and not the product of learning, Kolb (2015). In experiential learning, the instructor guides rather than directs the learning process where students are naturally interested in learning. The instructor assumes the role of facilitator and is guided by a number of steps crucial to experiential learning as noted by Wurdinger (2010).

Instructional materials are educational resources used to improve students' knowledge, abilities, and skills, to monitor their assimilation of information, and to contribute to their overall development and upbringing.

Salandanan (2009) stressed that instructional materials offer the best means by which a teacher can provide direction in her student's daily search for new understanding and verifications, particularly by the use of printed materials. The researcher advocates the need to develop instructional materials such as modules to further help the learners acquire basic skills. This is supported by Vitasa (2006), who stresses that the development and the use of self-made – instructional materials as one strategy can help develop their skills in writing.

Finnerty (2013) studied "Can Participation in a School Science Fair Improve Middle School Students' Attitudes toward Science and Interest in Science Careers?" The results showed that the amount and source of assistance on a science fair project had a significant impact on students' posttest measures. Embedded in a curriculum that includes the teaching of inquiry practices, science fairs may play a role in the inspiration of future scientists, but more research needs to be done on the quality of students' experiences.

3. Research Questions

The study aimed to develop and validate a guidebook in writing investigatory projects for Grade 10 students.
Specifically, it sought to find answers to the following problems:

1) What is the level of performance of the students exposed and not exposed to the developed guidebook?
2) Is there a significant difference between the pretest and posttest results of the exposed and not exposed groups to the developed guidebook?
3) Is there a significant difference between the performance of the students exposed and not exposed to the developed guidebook as revealed by the post test results?
4) What is the percentage of increase on the level of performance of the respondents exposed and not exposed to the developed guidebook as revealed by the posttest results?
5) What is the level of acceptability of the developed guidebook in writing investigatory projects as evaluated by the student respondents and experts with respect to the following:

1.1 content;
1.2 clarity;
1.3 appeal to target user;
1.4 originality;
1.5 learning activities;
1.6 applicability or usefulness; and
1.7 format?

6) Is there a significant difference between the evaluations of the two groups of respondents on the acceptability of the developed guidebook in writing investigatory projects with respect to the above mentioned criteria?

4. Scope and Limitation

The study aimed to develop a guidebook in writing investigatory projects. The study was conducted at San Juan National High School during the 2nd grading period of school year 2015 – 2016. An experimental study was employed to test the validity and acceptability of the proposed guidebook. Thirty (30) students were chosen from

the Grade 10 students and were grouped into two groups according to their performance level during the first quarter. This ensured that the selection of respondents is equal in abilities. Students' performance from low, average and high was considered in the selection of respondents of the two groups.

The topics or lessons included in the guidebooks were: Part 1 which consists of the Learning guide; Introduction to SIP; Safety Guide; Selecting a Topic; The Writing Format; Introduction and Background of the Study; Formulation of the Problem Statement; Formulation of the Hypothesis; Significance of the Study; Scope and Limitation of the study; Definition of Terms; Review of Related Literature and Studies; Methodology; Presentation and Analysis of Data; Summary of Findings and Conclusion; Findings; and the Writing Abstract. Each of the topics include lessons and guide followed by exercises to enhance students' skills in writing the specific part of SIP. Part 2 consists the Investigatory Project Practise and Samples which have 5 project abstracts and data and work sheets where students can practice writing their own SIP.

The implementation of the guidebook and the traditional method of teaching SIP were done during the afternoon since the student respondents are attending their classes in the morning. A pretest and posttest were administered to the student respondents to determine the performance of the students in SIP using the guidebook against the traditional approach.

The guidebook contains topics, exercises and appendices that are necessary for an elaborate explanation of some important details in SIP such as rubric and statistical tools.

A validated questionnaire checklist was administered to determine the level of acceptability of the guidebook in terms of content, clarity, appeal to target user, originality, learning activities, applicability or usefulness and format. The respondents were limited to twelve (12) Science Teachers from different secondary schools in the Division of Rizal who were actually competing in science fair competitions and three (3) Research Instructors from University of Rizal System Morong Campus who are experts in the field. All student respondents who used the guidebook were asked to answer the same checklist.

The level of acceptability was measured in terms of content, clarity, appeal to target user, originality, learning activities, applicability or usefulness and format.

5. Methodology and Research Design

The research model of the study in figure 1 illustrates how the researcher developed the research workbook.

The first frame is the input which includes the Grade 10 Achievers, experts, questionnaire checklists for the acceptability of content, clarity, appeal to target user, originality, learning activities, applicability or usefulness and format.

The second frame is the process, which contains development of guidebook, validation of the guidebook, experimentation or tryout of the guidebook, acceptability test, and data processing.

The third frame is the output which is the guidebook in writing investigatory projects.

The arrow pointing to process with feedback indicates that if the process is not successful after getting the feedback, then another process will be implemented until it reached the desired result.

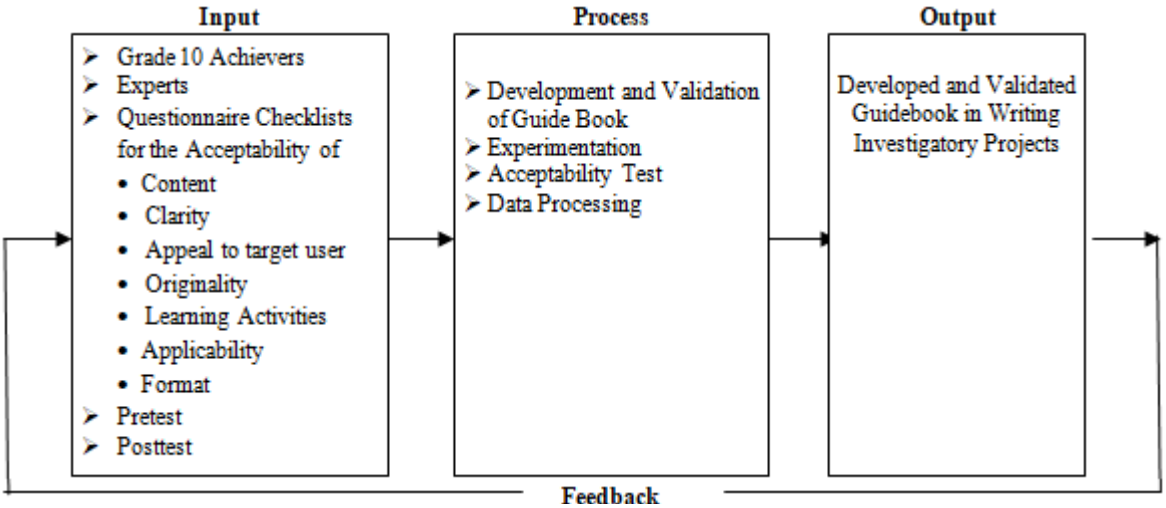

Figure 1: A Diagram of the Study Showing the Interplay of the Variables Involved in the Development of the Guidebook in Writing Investigatory Projects

The researcher utilized the developmental research method, experimental research design in evaluating the developed guidebook and descriptive- evaluative design in the acceptability test of the developed guidebook. Stratified sampling method was used in the selection of respondents.

To determine the level of acceptability of the developed guidebook, the student users and experts were asked to serve as respondents.

The researcher gathered different teacher made tests used by research teachers and master teachers about investigatory projects. A 50- item multiple choice test was constructed and administered to the Grade 10 special science class of Morong National High School. The test results were utilized for the item analysis where some of the items were revised or rejected. The final draft of the test consisted of 30 multiple choice items which was administered to the student respondents.

To determine the acceptability level of the developed guide, the researcher adopted the questionnaire of Mopera (2011). However, some modifications were done to suit it with the present instructional material. A validation of the revised questionnaire checklist was done by the panel members of the current study as well as experts who validated the developed guidebook.

After the respondents were chosen, the researcher administered the pretest. One group was provided with individual guidebook that was developed by the researcher while another group underwent traditional classes under the researcher's supervision. The researcher administered the posttest which was parallel with the pretest. The posttest was administered to determine the level of performance of students exposed and not exposed to the developed guidebook.

The acceptability of the guidebook was evaluated by the experts and the students exposed to the guidebook by answering the questionnaire-checklist.

The answered questionnaire- checklist for the teachers and students exposed to the guidebook and the scores of the student-respondents on the pretest and posttest were tallied, analyzed, and statistically treated with the assistance of the University of Rizal System Statistics Center to ensure the reliability of the results and to find out whether the developed guidebook was acceptable as perceived by experts and students for future use.

The level of students' performance based on pretest and posttest scores was evaluated using the following scale.

25- 30 - Very High
19- 24 - High
13- 18 - Average
7 - 12 - Below Average
0 - 12 - Poor

The scale used in the questionnaire-checklist to determine the acceptability are as follows:

5 – Very much Acceptable
4 – Acceptable
3 - Moderately Acceptable
2 – Less Acceptable
1 – Not Acceptable

To determine the level of performance of the students exposed and not exposed to the developed guidebook the researcher utilized mean and standard deviation.

Dependent t- test was used to determine the significant difference between the pretest, posttest results of the exposed and not exposed groups to the developed guidebook.

The significant difference between the performance of the students exposed and not exposed to the developed guidebook as revealed by the post test results was determined by means of independent t- test.

The increase on the level of performance of the respondents exposed and not exposed to the developed guidebook as revealed by the posttest results was determined using percentage.

The level of acceptability of the developed guidebook in writing investigatory projects as evaluated by the student respondents and experts with respect to content, clarity, appeal to target user, originality, learning activities, applicability or usefulness and format was determined using mean.

The significant difference between the evaluations of the two groups of respondents on the acceptability of the developed guidebook in writing investigatory projects with respect to content, clarity, appeal to target user, originality, learning activities, applicability or usefulness and format was determined through independent t- test.

6. Results and Discussion

This presents the analysis and presentation of data based from the sub problems of the study.

Table 1: The Level of Performance of the Students Exposed and Not Exposed to the Developed Guidebook in Writing Investigatory Projects

Group		Mean	SD	VI
Exposed	Pretest	14.87	0.99	Average
	Posttest	25.13	1.39	Very High
Not Exposed	Pretest	14.00	1.43	Average
	Posttest	22.27	1.36	High

The table reveals that the students exposed to the developed guidebook achieved a very high performance on the posttest having a mean value of 25.13 against an average performance on the pretest with a mean value of 14.87. These values are better than those who are not exposed to the guidebook since their pretest average performance of 14.00 mean value increases only to high performance with a mean value of 22.27.

The results reveal a greater increase using the developed guidebook which implies that utilizing the guidebook is more effective than traditional method of teaching in increasing the students' performance.

Table 2: t- test Results on the Level of Performance of the Students Exposed and Not Exposed to the Developed Guidebook in Writing Investigatory Projects

Group		Mean	Sd	t	df	Sig	H_O	VI
Exposed	Pretest	14.87	0.99	14.29	14	.000	R	S
	Posttest	25.13	1.39					
Not Exposed	Pretest	14.00	1.43	10.35	14	.000	R	S
	Posttest	22.27	1.36					

It can be observed from the table that there are significant differences on the test scores between the pretest and posttest of the exposed and not exposed group. Both groups mentioned got a significant value of 0.000. This value is less than the critical value of 0.05. Because of this, the null hypothesis which states that there is no significant difference between the pretest, posttest results of the exposed and not exposed groups to the developed guidebook is rejected.

Table 3: t- test Results on the Level of Performance of the Students Exposed and Not Exposed to the Developed Guidebook in Writing Investigatory Projects With Respect to Posttest Results

Group	Mean	Sd	t	df	Sig	H_O	VI
Exposed	25.13	1.39	3.30	28	0.011	R	S
Not Exposed	22.27	1.36					

The table reveals that there is a significant difference on the test scores of the exposed and not exposed students since it has a significant value of 0.011. This value is less than the critical value of 0.05. Therefore, the null hypothesis that there is no significant difference between the performance of the students exposed and not exposed to the developed guidebook as revealed by the posttest results is rejected

The statistical result reveals that the performance of the exposed students is significantly better than the not exposed students.

Table 4: Percentage Increase on the Level of Performance of Respondents Exposed and Not Exposed to the Developed Guidebook in Writing Investigatory Projects

Exposed	Not Exposed	% Increase
25.13	22.27	12.84

The table reveals that the group exposed to the developed guidebook increased their performance by 12.84 percent more than the percentage score of the not exposed group. This implies that the developed guidebook is more effective than the traditional method in teaching investigatory projects. The results imply that the varied activities and techniques used in the guidebook were very helpful to the learners, and the tandem of teaching and learning was evident allowing the students to work independently.

Table 5: The Level of Acceptability of the Developed Guidebook in Writing Investigatory Projects as Evaluated by Students and Experts with Respect to Different Criteria

Content	Teacher		Student		Overall	
	Mean	VI	Mean	VI	Mean	VI
1. The topics are well arranged to provide clear sequence of understanding.	4.90	VMA	5.00	VMA	4.90	VMA
2. The different parts aid the students in grasping the concept of the guidebook in a systematic way.	4.59	VMA	3.00	A	4.53	VMA
3. It provides sufficient repetition of learning through examples to easily understand the concept.	4.69	VMA	5.00	VMA	4.70	VMA
4. It provides a variety of exercises from simple to complex manipulation for mastery of concepts and skill.	4.59	VMA	5.00	VMA	4.60	VMA
5. The ideas and concepts of research are well expressed in the guidebook.	4.76	VMA	5.00	VMA	4.77	VMA
Average	**4.70**	**VMA**	**4.60**	**VMA**	**4.70**	**VMA**
Clarity						
1. The guidebook is organized and clear.	4.90	VMA	5.00	VMA	4.90	VMA
2. Directions are understandable and easy to follow.	4.61	VMA	4.00	A	4.59	VMA
3. Topics are well explained and become the preparatory stage for the exercises.	4.48	VMA	5.00	VMA	4.50	VMA
4. The hierarchy of the exercises is presented from simple to complex.	4.41	VMA	5.00	VMA	4.43	VMA
Average	**4.60**	**VMA**	**4.75**	**VMA**	**4.61**	**VMA**
Appeal to the Target User						
1. It captivates the student's interest.	4.59	VMA	3.00	A	4.53	VMA
2. It stimulates the student's interest in answering the different activities.	4.31	VMA	3.00	A	4.27	VMA
3. It enables students to develop their scientific skills.	4.52	VMA	5.00	VMA	4.53	VMA
4. It strengthens the students' positive attitude about research.	4.55	VMA	5.00	VMA	4.57	VMA
5. It is worth of time, effort and energy of the students.	4.62	VMA	4.00	A	4.60	VMA
Average	**4.52**	**VMA**	**4.00**	**A**	**4.50**	**VMA**
Originality						
1. The design and appearance of the guidebook are exceptionally different from other guidebooks.	4.59	VMA	5.00	VMA	4.60	VMA
2. The material serves as the new model in teaching research.	4.45	VMA	5.00	VMA	4.47	VMA
3. It provides a variety of relevant evaluation measures.	4.48	VMA	5.00	VMA	4.50	VMA
Average	**4.51**	**VMA**	**5.00**	**VMA**	**4.52**	**VMA**
Learning Activities						
1. The activities are applicable to the concepts being developed.	4.66	VMA	5.00	VMA	4.67	VMA
2. The guidebook leads the students to become actively involved in the learning activities.	4.66	VMA	5.00	VMA	4.67	VMA
3. The activities enable the students to assess his mastery of the entire content.	4.45	VMA	5.00	VMA	4.47	VMA
4. The activities are made in style wherein there are connection between what the students are learning and what they will learn.	4.72	VMA	4.00	A	4.70	VMA
5. The students receive immediate feedback for the tasks they asked to do.	4.45	VMA	5.00	VMA	4.47	VMA
Average	**4.59**	**VMA**	**4.80**	**VMA**	**4.59**	**VMA**
Applicability/ Usefulness						
1. The guidebook takes into account the attitudes and abilities of the students.	4.59	VMA	5.00	VMA	4.60	VMA
2. The guidebook is easy to use and transportable to the place of learning.	4.76	VMA	5.00	VMA	4.77	VMA

3. The guidebook will guide the students to the principles and concepts of research.	4.52	VMA	5.00	VMA	4.53	VMA
4. The guidebook is adaptable to any size of the learning group and differences in learning time.	4.55	VMA	5.00	VMA	4.57	VMA
5. The guidebook teaches and guides the students during actual performance of various learning activities.	4.62	VMA	5.00	VMA	4.63	VMA
Average	**4.61**	**VMA**	**5.00**	**VMA**	**4.62**	**VMA**
Format						
1. The font is readable and the font size is fitted for modules.	4.83	VMA	5.00	VMA	4.83	VMA
2. The illustrations/pictures are clear and descriptive.	4.72	VMA	4.00	A	4.70	VMA
3. The words that are used are appropriate to the level of the learners.	4.69	VMA	4.00	A	4.67	VMA
4. The spacing is enough.	4.82	VMA	5.00	VMA	4.83	VMA
5. The style of the writing and topic presentation make the guidebook enjoyable to read.	4.76	VMA	5.00	VMA	4.77	VMA
Average	**4.76**	**VMA**	**4.60**	**VMA**	**4.76**	**VMA**

Legend: VMA= very much acceptable, A= acceptable

Table 5 revealthe qualities of the guidebook with regards to different criteria and the specific levels of acceptability as perceived by experts and students. It shows that all specific qualities of the guidebook are very much acceptable. It further implies that the guidebook has very good qualities as an instructional material that can help increase students' performance.

Table 6: Composite Table on the Level of Acceptability of the Developed Guidebook in Writing Investigatory Projects as Evaluatedby the Students and Experts with Respect to Different Criteria

Criteria	Teacher		Student		Overall	
	Mean	VI	Mean	VI	Mean	VI
Content	4.70	VMA	4.60	VMA	4.70	VMA
Clarity	4.60	VMA	4.75	VMA	4.61	VMA
Appeal to the Target User	4.52	VMA	4.00	A	4.50	VMA
Originality	4.51	VMA	5.00	VMA	4.52	VMA
Learning Activities	4.59	VMA	4.80	VMA	4.59	VMA
Applicability/ Usefulness	4.61	VMA	5.00	VMA	4.62	VMA
Format	4.76	VMA	4.60	VMA	4.76	VMA
Overall	4.61	VMA	4.68	VMA	4.61	VMA

Legend: VMA= very much acceptable, A= acceptable

As shown on table 6, the overall result in all criteria has an average score of 4.61 with a verbal interpretation of very much acceptable. This means that all criteria of the developed guidebook have been met and was very much acceptable to both student respondents and experts.

Table 7: The Significant Difference Between the Evaluation of the Two Groups of Respondents on the Acceptability of the Guidebook in Writing Investigatory Projects with Respect to the Different Criteria

	Respondents	Mean	Sd	t	df	Sig	H_O	VI
Content	Teacher	4.70	0.37	0.27	28	0.79	FR	NS
	Students	4.60	.					
Clarity	Teacher	4.60	0.40	0.37	28	0.71	FR	NS
	Students	4.75	.					
Appeal to the Target User	Teacher	4.52	0.43	1.18	28	0.25	FR	NS
	Students	4.00	.					
Originality	Teacher	4.51	0.40	1.23	28	0.23	FR	NS
	Students	5.00	.					
Learning Activities	Teacher	4.59	0.35	0.59	28	0.56	FR	NS
	Students	4.80	.					
Applicability/ Usefulness	Teacher	4.61	0.36	1.06	28	0.30	FR	NS
	Students	5.00	.					
Format	Teacher	4.76	0.30	0.53	28	0.60	FR	NS
	Students	4.60	.					

It can be observed from the table that there is no significant difference on the evaluation of student respondents and experts in all criteria. All the criteria in the developed guidebook in writing investigatory projects got a non-significant value which is greater than the critical value of 0.05. Because of this, the null hypothesis that there is no significant difference between the evaluation of the two groups of respondents on the acceptability of the guidebook with respect to clarity, appeal to target user, originality, learning activities, applicability or usefulness and format is accepted.

Therefore, it suggests that the respondents have the same perception that the developed guidebook in writing investigatory projects is acceptable. The result is an indication that the guidebook is a good instructional material when it comes to the different aspects presented in the study.

7. Summary of Findings

Based on the analysis and interpretation of data, the following are hereby summarized:

1) The performance of the students exposed and not exposed to the developed guidebook in writing investigatory projects increased as revealed by pretest and posttest results.
2) The posttest mean scores of the two groups are significantly higher than their pretest mean scores.
3) The posttest mean scores of the two groups of students significantly differ where the exposed group obtained higher mean scores than the not exposed group.
4) The mean score of the exposed group who utilized the developed guidebook is 12.84% higher than the mean score of the group who was taught the traditional way.
5) The developed guidebook is very much acceptable in terms of Content, Clarity, Appeal to Target User, Originality, Learning Activities, Applicability or Usefulness and Format according to the perception of the students and experts.
6) Evaluation of the student respondents and experts does not differ significantly. This is a good indication that both groups equally agreed that the guidebook possess the qualities of a good instructional material that could improve the performance of the students in writing investigatory projects.

8. Conclusions

Based on the summary of findings, the following conclusions were drawn.

1) The developed guidebook and the traditional method of instruction are both effective in increasing the students' performance in writing investigatory projects.
2) The use of the developed guidebook and traditional method of teaching greatly affects the performance of the students in writing investigatory projects.
3) The developed guidebook better increased the performance of the students as a result of interesting activities, scientific investigation, critical thinking and better understanding of concepts through different exercises.
4) The traditional way of teaching could be enhanced with the use of the developed guidebook in writing investigatory projects in order to have a better result in students' performance.
5) The students and experts agreed that the developed guidebook in writing investigatory projects is a valid and acceptable instructional material in writing investigatory projects.
6) The students and experts has the same level of perception that the developed guidebook will be a good instructional material that can help improve learners' performance by means of delivering good qualities in its development.

9. Recommendations

Based on the findings and conclusions, the following recommendations are offered.

1) The guidebook could be used as an effective alternative instructional material to traditional way teaching investigatory projects.
2) Educators should make us of validated instructional materials to assist in the traditional method of teaching in order to enhance learners' performance in writing investigatory projects.
3) Instructional materials should have interesting activities, investigations that develop critical thinking, and exercises that will help learners find better understanding of concepts.
4) The developed guidebook may be published, disseminated and used by teachers in science classes to enhance students' academic performance and to elicit feedback for the improvement of the instructional material.
5) A similar/ parallel study may be conducted to determine the validity and acceptability of the guidebook by subjecting it to use of other students from other grade level.

10. Action Plan

Based on the results of the study the following action plan was formulated to address the need of developing students' skills in science through investigatory projects.

Proposed Action Plan School Year 201-2016

Area of Concern	Objectives	Key/ Strategies	Time Frame	Persons Involved	Performance Indicator	Budgetary Requirements
Students' Development	Training of Students on Research	Seminar workshop in SIP School Based Science Research Congress Division Science Fair Contest	July 2016 August 2016 September 2016	Science Teachers Experts in research Teacher coaches	Approved research topic Research Output Presented at school/ division level	10,000
Staff Development	Teachers' Training on Science Research Teachers' training on statistical tools	INSET/ LAC Sessions Coaching on School Based Science Research Congress Coaching on Division Science Fair Contest	May and October 2016 August 2016 September 2016	Master teachers/ Experts in Statistics	Students and teachers presented their research output in the school and division level.	10,000
Curriculum Development	Print Out SIP Guidebook	Reproduction of SIP Guidebook	May 2016	Principal/ Dept. head	Hard copy of SIP Guide book	5,000

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