Coupled-Inquiry Lessons in Grade 11 Physical Science
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Abstract:
The study aimed to develop coupled-inquiry lessons and determine the manifestations of higher order thinking skills and inquiry skills during the conduct of the lessons as well as the effects of these lessons on the student’s conceptual understanding, science process skills, and attitudes towards Physics. The study applied a combined descriptive and developmental research methods employing pre-experimental research design. The following findings are derived from the study: 1.) The developed coupled - inquiry lessons in Grade 11 Physical science are aligned to the K to 12 Science learning competencies; 2.) students who were exposed to coupled - inquiry lessons manifested higher order thinking skills and inquiry skills and; 3.) the conceptual understanding, science process skills and attitudes towards Physics of the students significantly improved after exposure to coupled-inquiry lessons. Based from the findings, the following recommendations are forwarded by the researcher: 1.) the developed lessons in this study can be adopted and utilized by Grade 11 Physical Science classes; 2.) teachers may develop coupled-inquiry lessons for other grade level and other subjects guided by the lessons developed and implemented in this study; 2.) Curriculum developers and administrators may consider to provide trainings and orientation on Coupled-Inquiry; 3.) Since Coupled-Inquiry cycle is highly activity based, school administrators must strongly consider the provisions of classroom, facilities, laboratory and supplies needed to carry out coupled-inquiry activities and; 4.) Researchers may study further the effects of coupled - inquiry Lessons using an experimental method to validate the claims forwarded by this study.

Keywords: attitude, conceptual understanding, coupled-inquiry, higher order thinking skills, inquiry skills, and science process skills.

I. INTRODUCTION

“If we teach our students the way we were taught yesterday; we rob them of tomorrow”. This statement by John Dewey reminds us that the trends in education are constantly evolving. Globalization and modernization have caused significant changes in the nature of learners and learning process. Along with this, various educational reforms and researches on appropriate approaches and strategies are being implemented and conducted worldwide. The low performance of the country in Trends in International Mathematics and Science Study (TIMSS) 2003 and 2008 is among the challenges in the field of education. Philippines got low scores particularly in the three (3) cognitive domains: factual knowledge, conceptual understanding, and reasoning and analysis. This was mentioned by Merle C. Tan, Director of University of the Philippines – National Institute for Science and Mathematics Education (UP-NISMED) during the international convention of group of experts in Science and Mathematics Education Policies last 2009. She presented the identified reasons accounted from local studies which are: lack of qualified teacher, an overloaded curriculum, lack of quality textbooks and instructional materials, and unavailability of science equipment. This resulted to the formulation of Basic Education Sector Reform Agenda (BESRA) in 2005, wherein the five (5) key reform thrusts are: social support to learning, complementary interventions, DepEd’s institutional culture, teachers, and schools (UNESCO Education Sector, 2010). The initial implementation of Senior High School is another concern. This involves challenges, problems and adjustments which need urgent answers and solutions. Contreras (2014) narrated what was tackled in the forum conducted by the National Academy of Science and Technology through Mathematical and Physical Science Division last January 2016. He mentioned that there is still work to be done in addressing the challenges brought about by the implementation and improvement of the system and the curriculum itself as we are already in the last phase of the transition period. He identified issues such as addressing the teacher’s training needs, ability to adjust with the current set-up and capacity building as among the concerns which need to be addressed. He pointed out that lack of learning materials, facilities and manpower are among the problems brought about by the initial implementation of K-12 curriculum. He also stated that there are teaching related challenges and there is a need for the teacher to assess and reflect on their teaching practices, policies and resources to enable students to learn effectively. The developed coupled – inquiry lessons in grade 11 Physical Science feature a combination of guided and open inquiry methods. According to Dunkhase (2000) this method can be used by the teacher in order to address the issue concerning content control as well as curriculum goals. It strikes the balance between teacher directed and student driven inquiry by providing the right amount of structure and guidance to assure success (Krauss and Boss, 2013).

II. FRAMEWORK

Conceptual Framework
The student’s understanding is the central focus of inquiry learning (Anderson, 2012). In inquiry learning, the role of students is no longer passive receiver of knowledge but active participants in learning process. For inquiry based learning environment, learning can be manifested through the
development of some aptitudes like higher order thinking skills, inquiry skills and science process skills. Teachers want to maximize learning in the classroom by engaging students to investigations. Coupled-Inquiry which strikes the balance between teacher - directed and student driven inquiry provides the right amount of structure and guidance to assure success in learning (Krauss and Boss, 2013). The following figure shows the conceptual paradigm of the study.

![Conceptual paradigm](image)

**Objectives of the Study**

The study aimed to develop coupled-inquiry lessons, determine the manifestations of higher order thinking skills (HOTS) and inquiry skills during the conduct of the lessons, and determine the effects of the coupled - inquiry lessons on the student’s conceptual understanding, science process skills, and attitudes towards Physics.

**III. MATERIALS AND METHODS**

**Research Design**

The study used developmental research to come up with coupled inquiry lessons in Physical Science, descriptive research method to describe the developed coupled-inquiry lessons, manifestations of higher order thinking skills and inquiry skills during the conduct of the lessons and the effects of the coupled inquiry lessons on the students’ conceptual understanding, science process skills and attitudes towards Physics. It also employed the pre-experimental research design, specifically the single group pre-test and post-test study.

The pre-experimental design used in this study is illustrated as follows:

\[ O_1 \xrightarrow{X} O_2 \]

WHERE:

- \( O_1 \) - PRE-TEST
- \( X \) - TREATMENT (COUPLED INQUIRY LESSONS)
- \( O_2 \) - POSTTEST

**Research Site**

Gubat National High School, a large integrated public secondary school is the locale of this study. This school got an over-all average MPS of 41.62 from school years 2011 to 2015. In the same period, its average MPS in Science is 34.40 (Continuous Improvement Program team, 2017). These values are far from the national target of 75% MPS. This situation calls for intervention to be implemented in order to enhance science instruction and consequently to improve the school’s academic performance.

**Participants**

The respondents of the study were composed of 30 Grade 11 senior high school General academic strand students of Gubat National High School in school year 2018-2019 and three (3) process-observers composed of one (1) Department Head and two (2) Assistant Principals.

**Instrumentations**

The instruments used in this study are: focus group discussion guide, students’ journal guide, interview guide for the process - observers, learner’s reflective log, inquiry student scoring rubric, conceptual understanding test, science process skills test, and Physics learning attitude survey.

**Validation of Instrument**

The researcher developed a focus group discussion guide, students’ journal guide, student reflective log and interview guide for the process - observers. These were submitted to eight jurors for evaluation and validation. Suggestions and recommendations were considered in the revision of these instruments. These instruments were rated 4.51, 4.60, 4.56 and 4.63 respectively. These ratings are described as outstanding which means that the instruments complied with the criteria set forth.

**Test Development and Validation**

The researcher initially constructed a 50- itemmultiple choice conceptual understanding test. The tests were piloted to a Grade 12 class in Bagacay National High School. Students’ answers were subjected to item analysis. The Cronbach’s alpha of the conceptual understanding test is 0.781 indicated good test reliabilities. The tests were further subjected to the validation of eight (8) experts who taught Physics or Grade 11 Physical Science. The data obtained from the experts showed an overall weighted mean of 4.54 on the consistency of items to the competencies and 4.62 on the appropriateness of the items to the level of cognition. Both ratings were considered outstanding.

**IV. DATA GATHERING PROCEDURE**

**Lesson Plan Development and Validation**

The researcher developed lessons which were subjected to validation. The average rating of experts is 4.57 which is described as outstanding based on the following criteria: (1) instructional objectives, (2) lesson’s concepts, (3) Lesson Proper, and (4) the coupled-inquiry activities. The Fleiss’ Kappa, inter-rater reliability of the experts is 0.781 which shows a good measure of reliability. The recommendations from the experts where considered in the revision of the lessons.

**Lesson Implementation**

The researcher administered lessons which started with the pre-tests on conceptual understanding, science process skills, and attitudes towards Physics. The class was then exposed to the coupled inquiry lessons featuring the coupled inquiry activities prepared by the researcher. Process-observers were present during the conduct of the coupled inquiry activities and they described the manifestations of higher order thinking skills and inquiry skills. After exposure to the developed lessons, post-tests were administered and the results were used to assess any change in the variables identified. The observation notes, ratings in using
the inquiry scoring rubric, learner’s reflective log, teacher’s reflective log, and checklist were collected and analysed.

**Statistical Treatment of Data**
Fleiss Kappa was used to measure reliability of the expert’s evaluation and validation of the developed coupled inquiry lessons, conceptual understanding test, interview guided to the process-observer, focused group discussion guide, students’ reflective log and guide to students journal. Cronbach alpha was used to determine the internal validity of the conceptual understanding test. The mean, mean difference and paired t-test was used to analyse the data between pretests and posttest for the conceptual understanding test, science process skills inventory and CLASS attitude survey.

**IV. RESULTS AND DISCUSSION**

**The Coupled- Inquiry Lessons**
The developed lessons include topics on Aristotelian and Galilean Views of Motion, Free Fall, Projectile Motion, Position versus Time Graph, Velocity versus Time Graph, Acceleration, Law Inertia, Law of Acceleration, and Law of Interaction. These Coupled - Inquiry lessons are intended for nine (9) hours or 2 - week class implementation as prescribed in the Curriculum Guide for Grade 11 Physical Science by the DepEd.

![Figure 2. The coupled-inquiry learning model](image)

**Manifestations of Higher Order Thinking skills**
The manifestations of Higher Order Thinking skills during the conduct of the Coupled-Inquiry lesson were identified by the process-observers. These were pointed out during the focus group discussions and in their answers to the interview guide for process-observers. As observed, the HOTS such as applying, analysing, evaluating and creating were manifested in all the stages of the lessons. The responses of the students to the reflective logs also revealed that during the conduct of the lessons, they manifested different levels of HOTS and as they were exposed to more lessons, their HOTS improved and developed.

**Manifestations of Inquiry Skills**
In the same manner as that of the HOTS, the inquiry skills which were manifested by the students during the conduct of the lessons were also identified by the process-observers during the focus group discussion and in their answer to the interview guide for process-observers and inquiry scoring rubric. As observed, inquiry skills such as inferring predicting, comparing, formulating hypothesis, developing experimental design, observing and experimenting and communicating results were manifested by the students. The data from the students’ reflective log further described the manifestations of inquiry skills during the conduct of the developed lessons. It revealed that the levels of inquiry skills in terms of formulating questions, designing and conducting scientific investigations, using appropriate tools and techniques to collect and record data, formulating and revising scientific explanation and model using logic and evidence and communicating and defending a scientific argument were manifested by them.

**Effects of Coupled - Inquiry Lessons**
The effects of the developed lessons on students’ conceptual understanding, science process skills and attitudes towards Physics were evaluated quantitatively using the results of pre-test and post-test on conceptual understanding, science process skills and CLASS attitude survey.

**Conceptual Understanding**
Conceptual understanding in this study refers to the mean gain in the 40-item multiple choice conceptual understanding test which was administered before and after the conduct of the lessons. This was described in the observation note of the process-observers and in the records from student’s journals. The process-observer described how the conceptual understanding of the students improved after the conduct of the Coupled-Inquiry lessons during the focused group discussion. According to them: “The positive effect in terms of understanding concepts were attained through hands on activities”, “Students demonstrated ability to transfer their knowledge into new situation” and “The students were able to define and apply the concepts tackled in the lessons”. These comments from the process - observers show that conceptual understanding of the students improved after the implementation of the lessons. This was achieved because the students were engaged in scientific inquiry during the lessons. These hands-on activities allow the students to perform investigations and to discover the concepts about the lessons. The students were able to apply the knowledge to new situations by giving similar example. They were likewise given the opportunity to make decisions by applying the principle that they learnt during the lesson. Furthermore, students were able to clearly state the concepts and apply them to solve problems as well as explain related situations. The effect of the lessons on conceptual understanding was also described by the students in their journal saying that: “After the lesson, lot of things was improved on me specially on in terms of my understanding about motion”, “I find it easier to remember concepts about the lesson”, “I learned so many things about motion and I can use it in daily life then share it to others”. These statements from the students point out that they understood the lessons well, they were able to retain the concepts in their mind and they were able to associate them to daily life. This also implies that exposure to Coupled-Inquiry lesson may lead to a deeper conceptual understanding among students. The positive effect on conceptual understanding may be attributed to the hands-on activities in the Coupled-Inquiry Cycle. In the developed lessons, these hands-on activities took place during the guided and the open inquiry stages. Here, the students performed activities intended to allow
them to learn collaboratively and inductively the knowledge and skills incorporated in the lessons. This fits in to the idea of social constructivism by Vygotsky who explained that learning has its social context and that all cognitive functions originate in, and must therefore be explained as products of social interactions (Harvis, 2005). According to this theory, the value of collaboration is an essential tool to maximize learning. Table 1 shows the mean gain scores of students in the conceptual understanding test per competency.

### Table 1. Mean gain in the conceptual understanding test

<table>
<thead>
<tr>
<th>Competencies</th>
<th>No. of Items</th>
<th>Pre test Mean Score</th>
<th>Post test Mean Score</th>
<th>Gain Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compare and contrast the Aristotelian and Galilean concepts of vertical,</td>
<td>7</td>
<td>2.63</td>
<td>3.73</td>
<td>1.10</td>
</tr>
<tr>
<td>horizontal and projectile motion.</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Explain how Galileo inferred that objects in a vacuum fall with uniform</td>
<td>7</td>
<td>2.60</td>
<td>4.43</td>
<td>1.83</td>
</tr>
<tr>
<td>acceleration, and that force is not necessary to sustain horizontal motion.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explain how the position vs. time graph of constant velocity motion is</td>
<td>9</td>
<td>3.10</td>
<td>6.37</td>
<td>3.27</td>
</tr>
<tr>
<td>different from those of constant acceleration motion.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognize that everyday usage and the Physics usage of the term “acceleration”</td>
<td>8</td>
<td>2.07</td>
<td>4.20</td>
<td>2.13</td>
</tr>
<tr>
<td>differ in Physics an object that is slowing down, speeding up, or changing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>direction is said to be accelerating.</td>
<td></td>
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<tr>
<td>Explain Newton’s three laws of motion</td>
<td>9</td>
<td>2.87</td>
<td>5.17</td>
<td>2.30</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>13.27</td>
<td>23.90</td>
<td>10.63</td>
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</tbody>
</table>

The data in this table shows that the scores in the conceptual understanding test in all the learning competencies which were covered in the lesson increased. This result agrees with what Rowley (2006) found out in his study which revealed that Coupled - Inquiry cycle can improve students’ understanding of science concept. Using the results of the conceptual understanding test, the p value was computed by paired t-test to determine the significant difference of this mean gain. An alpha of 0.05 was used. The p value computed is 1.14E-12 between pre-test and post-test. This shows a highly significant difference between the results of pre-test and post-test.

### Science Process Skills

This study determined the effect of coupled-inquiry to the science process skills among students. These process skills includes: formulating question based on scientific knowledge; asking questions which can be answered by means of collecting data; designing a scientific procedure to answer a question; communicating a scientific procedure to others; recording data accurately; using data to create graph/table for presentation; communicating results of investigation; analyzing the results of a scientific investigation; using a scientific concept and terms to communicate results of investigation; using models/analogies to explain results of investigation; and using the results of investigation to answer question. The effect of the coupled-inquiry lessons on science process skills was measured using the results of the pre-test and post-test of the Science Process Skills Inventory (SPSI). The results were then validated by the description and statements in the journals, notes, logs of the students and process-observer as well as the focused group discussion. Table 2 shows the mean gain of the class for science process skills. The mean score in the pre-test was 24.90 while in post-test it was 36.87 which is equivalent to mean gain of 11.97 and corresponding PL increase of 27.20%. The average gain scores of students in IPSS is 13.07. Using these results, the p value was computed by paired t-test to determine the significant difference of this mean gains. An alpha of 0.05 was used.

The p value computed is 1.59E-18 between pre-test and post-test. This shows highly significant difference between the results of pre-test and post-test. Based from the results presented in Table 2, it can be gleaned that the science process skills of students in the way of formulating question based on scientific knowledge, asking questions which can be answered by means of collecting data, designing a scientific procedure to answer a question, communicating a scientific procedure to others, recording data accurately, using data to create graph/table for presentation, communicating results of investigation, analyzing the results of a scientific investigation, using a scientific concept and terms to communicate results of investigation, using models/analogies to explain results of investigation and using the results of investigation to answer question significantly improved after their exposure to the coupled-inquiry lessons. The science process skills with the highest increase is formulating question based on scientific knowledge while using the results of investigation to answer question has the least amount of increase.
The high improvement in terms formulating questions based on scientific knowledge can be attributed to the engagement of the students to open inquiry. Here, the students brainstorm about the objective and from that they generate scientific questions. In every lesson, the students perform open inquiry activity thus they were able to practice formulating questions in every lesson. This observation is supported by some entries to students’ journal like: “I asked questions based on the problem”, “I understand first the topic before I make questions”, and “I make questions that can be answered through experiment”. These statements from the students show that they were able to consider scientific knowledge as basis for their questions. This further conforms to the observations of the process-observers as mentioned during the focused group discussion. According to them: “Students were able to make questions and follow-up questions related to the topic for clarifications”, “They brainstormed and formulated questions which they answered through investigations”, and “The students developed an inquiring mind and they became more curious about science lessons.” These comments from the process-observers validates that the students’ ability to formulate questions based on scientific knowledge improved after their exposure to coupled-inquiry lessons. Although the science process skills of students in terms of using the results of investigation to answer question has also increased, the increase is lower compared to other science process skills. Not all students were able to give correct answer to questions. At this instance, the students go back to the process and then repeat the investigation. This was true for some difficult activities which the students found difficult to answer. One instance for this was when; one group repeated the activity on comparing the rate of fall of free fall and projectile because they were not able to simultaneously release the two objects. To be able to compare accurately, they planned for another procedure. From that they came up with the answer to the question. This showed that the students recognized the value of having a correct and accurate result. It also implies that in inquiry based learning, the student may not perfectly carry out the investigation. This calls for the role of teacher to guide them so that they will be able to perform tasks correctly. The improvement of their science process skills was also described by the students in some of their journal entries. They mentioned that: “I learned to perform experiment”, “I solve problems and created models”, “I learned to design activity and follow procedure” and “I learned how to use science instruments safely”. It means that they were able to apply those skills in solving problems. This also proves that the science process skills of the students were developed during the conduct of the coupled-inquiry lessons. The process observers also mentioned during the focused group discussion that: “Students used alternative methods to solve problems and they solve problems easier and faster after three to four lessons using coupled-inquiry”, “proper sequence of the science process skills was observed and the student easily followed the procedure”, “Students developed a habit of connecting concepts using graphic organizers”, “generally, the students were able to formulate hypothesis, test and gather data, identify variables, interpret results and make conclusion”, “the students were able to make decisions as to how their group would be able to come up with better results”, “The developed method showed us that this approach can help student design and conduct scientific investigation” and “Students demonstrated skills like observing, classifying, measuring and predicting”. These comments from the process-observers also points out that indeed that the science process skills of the students were practiced and developed during the conduct of the lessons. These further shows that students engage in evidence based reasoning and creative problem-solving as well as “problem finding”.

### Attitude towards Physics

This study determined the effects of the coupled-inquiry lesson on attitudes towards Physics of students through the use of standardized attitude survey, the Colorado Learning Attitudes about Science Survey (CLASS). The results show that the use of coupled-inquiry results to positive effect in terms of attitudes towards Physics. These findings was the same as the result
obtained by Celiksoz (2014) who found out that Coupled-Inquiry activities were significantly effective in promoting scientific attitudes. Table 3, shows the percent favorable response of the students in the CLASS attitude survey. Positive shift of 0.12 indicates students’ attitudes towards Physics generally improved over the study period. The change in attitudes towards Physics was also described by the student and the process-observers. Some of the entries in the student’s journal are: “I enjoyed and I felt like a scientist while doing the activity”, “I felt good when I do my best in the experiment”, “I am glad that I was able to conduct the experiment”, “I love Physics because it is enjoyable”, “I was challenged about the topic but it is worth it because I did my best”, and ‘I feel excited in doing the activities”.

The process-observers also mentioned during the focused group discussion that: “Students became more interested to the daily lesson in Physics making them attentive, cooperative and enthusiastic in performing their tasks”, “Students demonstrated positive attitude toward the subject”, and “The students gain more motivation and confidence, they became more eager to have more experiments and hands-on activities, and they are excited to learn about new lesson” In addition, the teacher noticed that the students enjoyed while they learned as manifested in the manner by which they conducted the activities. One example was that during the activity on law of acceleration, one student reacted “It feels good to be like a kid again” when they used a toy propeller to determine the effect of the force to the acceleration.

Table 3. Percent Favorable Response for Class Survey

<table>
<thead>
<tr>
<th>Item no.</th>
<th>FR</th>
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<td></td>
<td>Pre</td>
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<td>1</td>
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<td>2</td>
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Legend: FR-Favorable Response
PFR-Percent Favorable Response

The results show effects of the lessons developed as stated above clearly shows that coupled-inquiry cycle can be helpful in developing the KSA’s of the student. These are the developments in terms of knowledge or conceptual understanding, skills, particularly the science process skills and the attitudes specifically attitudes towards Physics. This means that holistic development of the students can be attained using the coupled-inquiry cycle.

V. CONCLUSION

Findings

Based on the analysis of data gathered in this study the following findings are derived:

1. The developed lessons using coupled-inquiry Cycle consist of nine (9) lessons in Grade 11 Physical science which are competency-based and contain the following topics: Aristotelian vs. Galilean views of motion, projectile, free fall, position vs. time graph, velocity vs. time graph, acceleration, law of inertia, law of acceleration and law of interaction. These topics are anchored on the five competencies for Grade 11 Physical Science which are: Compare and contrast the Aristotelian and Galilean concepts of vertical, horizontal and projectile motion; Explain how Galileo inferred that objects in a vacuum fall with uniform acceleration, and that force is not necessary to sustain horizontal motion; Explain how the position vs. time graphs of constant velocity motion is different from those of constant acceleration motion; Recognize that everyday usage and the Physics usage of the term “acceleration” differ in Physics an object that is slowing down, speeding up, or changing direction is said to be accelerating; and Explain Newton’s three laws of motion. Using Coupled-Inquiry Cycle, each lesson featured the following stage: invitation to inquiry which is consist of interesting activities intended to stimulate students’ interest toward the lesson; guided inquiry which driven by a question for investigation; open inquiry activity where students formulated their own questions and hypothesis and then collaboratively conducted their investigation; inquiry resolution which is aimed at helping the students understand science concepts; and assessment which is intended to assess the progress of students and determine what they learned from the lesson. The Coupled-Inquiry lessons highlight the combining or “coupling” of the guided and open inquiry in one lesson.

2. Students manifested higher order thinking skills (HOTS) and inquiry skills during the conduct of the coupled-inquiry lessons.

3. The effects of the Coupled-Inquiry Lessons developed are as follows:
   a. Under conceptual understanding, all competencies were improved as evidenced by the by the average mean gain of 10.63.
   b. Under science process skills, the effect of the coupled – inquiry lessons to the students were improvements on: formulating question based on Scientific Knowledge; asking questions which can be answered by means of collecting data; designing a scientific procedure to answer a question; communicating a scientific procedure to others; recording data accurately; using data to create graph/ table for presentation; communicating results of investigation; analysing the results of a scientific investigation; using a scientific concept and terms to communicate results of investigation; using models/ analogies to...
explain results of investigation; and using the results of investigation to answer question. This is evidenced by the results of the Science Process Skills Inventory (SPSI) which revealed a significant mean gain of 11.97 and a gain in performance level of 27.20. This result is also reflected also in the students journal and the focused group discussion with the process-observers.

c. On attitudes towards Physics, the effect indicated a 0.12 positively shifted attitude towards Physics more likely towards expert’s response in the CLASS survey.

Conclusions

Based on the findings, the following conclusions are made:

1. The developed Coupled-Inquiry lessons in Grade 11 Physical science are competency-based and are aligned to the K to 12 Science competencies. These can be used as supplementary instructional resources for Grade 11 Physical Science classes.

2. Students who are exposed to Coupled-Inquiry lessons manifested higher order thinking skills and inquiry skills.

3. Students exposed to Coupled-Inquiry lessons improved conceptual understanding, science process skills and attitudes towards Physics.

VI. TRANSITIONAL RESEARCH

The findings of this study can be translated to teaching guide for science teachers focusing on the use of coupled-inquiry approach. Teachers may develop coupled-inquiry lessons for other grade level and other subjects guided by the coupled-inquiry lessons developed and implemented in this study. Curriculum developers and administrators may consider to provide trainings and orientation on coupled - inquiry. Since coupled-inquiry is highly activity based, school administrators must strongly consider the provisions of classroom, facilities, laboratory and supplies needed to carry out coupled-inquiry activities. Researchers may continue to study further the effects of coupled - inquiry lessons using an experimental method to validate the claims forwarded by this study.

VII. REFERENCES


