UNIVERSITY OF THE PHILIPPINES

Doctor of Philosophy in Education
(Major in Physics Education)

Rachel B. Remedios

PHENOMENOGRAPHY OF TEACHERS' AND STUDENTS' UNDERSTANDING, BELIEFS AND EXPERIENCES OF PHYSICS LEARNING ASSESSMENT

Dissertation Adviser:

Vivien M. Talisayon, PhD
Faculty of Education

Dissertation Reader/Critic:

Josefina L. Pabellon, PhD
Faculty of Education

Date of Submission
6 September 2018

Permission is given for the following people to have access to this dissertation:

Available to the general public	(Yes or No)
Available only after consultation with author/dissertation adviser	(Yes or No)
Available only to those bound by confidentiality agreement	(Yes or No)

Student's signature:
Signature of Dissertation Adviser:

University Permission Page

"I hereby grant the University of the Philippines a non-exclusive, worldwide, royalty-free license to reproduce, publish and publicly distribute copies of this dissertation in whatever form subject to the provisions of applicable laws, the provisions of the UP IPR policy and any contractual obligations, as well as more specific permission marking on the Title Page."

"Specifically I grant the following rights to the University:

a) To upload a copy of the work in the theses database of the college/school/insitute/department and in any other databases available on the public internet;

b) To publish the work in the college/school/institute/depatment journal, both in print and electronic or digital format and online; and

c) To give an open access to above-mentioned work, thus allowing "fair use" of the work in accordance with the provisions of the Intellectual Property Code of the Philippines (Republic Act No. 8293), especially for teaching, scholarly and research purposes."

Rachel B. Remedios

Student Name over Signature and Date

APPROVAL SHEET

The dissertation attached hereto **PHENOMENOGRAPHY OF TEACHERS' AND STUDENTS' UNDERSTANDING, BELIEFS AND EXPERIENCES OF PHYSICS LEARNING ASSESSMENT** in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Education (major in Physics Education), is hereby accepted.

VIVIEN M. TALISAYON, Ph.D.
Adviser

JOSEFINA L. PABELLON, Ph. D.
Reader/Critic

MYLA M. ARCINAS, Ph.D.
Member

JOSE PERICO H. ESGUERRA, Ph.D.
Member

SOLEDAD A. ULEP, Ph.D.
Member

Accepted in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Education (major in Physics Education)

RICARDO T. BAGARINAO, Ph,D.
Dean, Faculty of Education

This fruit of hard work, perseverance and love

is dedicated to God Almighty, Sherwin Jay, Lexine Jay,

Gabrielle Jay and Jullian Jay.

ACKNOWLEDGMENT

The researcher wishes to express her sincerest gratitude to the following who have been tremendously instrumental in the accomplishment of this study:

God Almighty, for the graces of wisdom, good health, provision, strength and love;

Her spouse, children and the whole family, for the love, support, understanding, prayer and inspiration;

Ateneo de Davao University, through the University President, Fr. Joel E. Tabora, S.J., Fr. Daniel J. McNamara, S.J., colleagues, experts and friends from the College Physics Department, School of Education, Social Science and the Senior High School Unit, for gracing the researcher with a Faculty Development Assistance through financial, expertise, moral and/or spiritual support and guidance;

Department of Education, Schools Division Superintendent (SDS) of the Division of Davao City, and the Principals of the two Senior High Schools for allowing the researcher to conduct the study in their schools;

SHS Physics teachers and Grade 12 STEM students for participating in this study as data sources and sharing their time, insights and trust to the researcher;

UPOU, Faculty of Education, for the consistent assistance and support to the researcher; and last but not the least, dissertation adviser, Dr. Vivien M. Talisayon, critic, Dr. Josefina L. Pabellon, and the rest of the panelists for the invaluable insights, support, assistance and expertise that they generously extended to the researcher. The researcher is forever indebted to all of them and wishes to thank them all once again.

ABSTRACT

The purpose of this phenomenographic study was to explore the understandings, beliefs, and experiences of Physics Learning Assessment (PLA) of senior high school Physics teachers and students in General Physics 1, a subject in the curriculum for the Science, Technology, Engineering, and Mathematics (STEM) strand. Specifically, this study answered the following research questions: (1) What are the SHS teachers' and students' ways of understanding Physics Learning Assessment in the following dimensions of understanding: knowledge, purpose, and process? (2) What are the SHS teachers' and students' beliefs about the effectiveness and efficiency of Physics Learning Assessment? (3) What do the SHS teachers' and students' find significant in their lived experiences of PLA as inferred from their most significant stories, emotions evoked by and insights gained from these experiences? (4) What are the teachers' and students' categories of description of PLA? And (5) What are the relationships among the teachers' and students' conceptions of PLA?

The study employed the exploratory-descriptive research design; hence, the sources of data included semi-structured interviews of the teacher-informants and focus group discussions (FGDs) with the student-participants. Classroom observation during a given PLA session and analysis of shared PLA tools for each FGD group of the four teachers were additional sources of data.

The study's sample consisted of four teachers and thirty-two students in Grade 12 General Physics 1 classes from two senior high schools in Davao City. The students made up four FGD groups with eight members in each group. These teachers and students were purposively selected because they were the direct users

of PLA.

The study adopted the phenomenographic paradigm, specifically the structure of awareness, as the phenomenographic analytical framework. The outputs of the analysis are the description of the SHS teachers' and students' ways of understanding, beliefs, and experiences of PLA; the categories of descriptions; and the outcome space which visually maps the relationships between the teachers' and students' conceptions of PLA. Moreover, the social constructivist perspective of learning and assessment was anchored on as part of the theoretical framework.

Based on the results of data analysis, the researcher inferred the following descriptions of the levels of sophistication from lowest to highest of teachers' and students' awareness of their conceptions of PLA: structural or "law abider", practical or "scientist-at-heart", and reflective or "conscientious" for the teachers; and for the students: grade-focused or “grade-conscious”; socially-focused or “social”; real-life-focused or “physical world appreciator”; and the motivation-focused or “motivator”.

The study explored and described the conceptions of the selected SHS teachers and students only, but the research design, specifically the data collection and analysis procedures, may be transferrable to other context and disciplines. It is recommended that Physics education researchers conduct a further study on the analysis of teachers' and students' conceptions of PLA in multi-cultural communities with a larger sample size, more senior high schools and inclusion of female teachers. It is also recommended that curriculum designers evaluate the coverage of the curriculum guide in General Physics 1 to make it more realistic considering the time allotted for the subject and the SHS students' readiness for it.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

Background of the Study

Assessment, being an indispensable component of curriculum practice, is the process of gathering and analyzing information from several varied sources to arrive at a comprehensive understanding of what students know and understand, and how much they are able to utilize these in various contexts (Huba and Freed, 2000). This essence of assessment includes a vast spectrum of methods, forms and types such as formal testing and examinations, practical and oral assessment, and classroom-based assessment (Gipps, 1999). Moreover, McAlpine (2002) emphasized the social and cultural dimensions of assessment by asserting that assessment must be understood, as a form of communication, not only between student and teacher, but also among school administrators, curriculum designers and policy-makers. Gipps (1999) commented that in the postmodern worldview, assessment is seen to "be value-laden and socially constructed". He further emphasized that in the said worldview of assessment, the observer and the observed cannot be detached from each other. People as social beings conceive and perceive the world through the lens of their values and perceptions, hence, their biographies must be at the center of interpreting what and how they experience different phenomena (Gipps, 1999) such as physics learning assessment.

In a literature review of the Scottish educational researches on assessment done by Miller (2006), one of his conclusions was that the "general research on assessment theory and practice seems well established, comprehensive and robust". However, he added that incompleteness and dissatisfaction occurred in the aspect of "specific issues or particular strands within the general categories that have been explored".

A review done by Uzunboylua and Asiksoyb (2014) of Physics Educational Researches (PER) published between 2008 and 2013, using the databases of EBSCO and ULAKBIM (a Turkish national academic network and information center), revealed that only about twelve percent (12%) of these researches were focused on assessment and evaluation compared to those on teaching methodologies, which was around thirty-four percent (34%). Among these, around fifty-five percent (55%) used quantitative methods and only about thirty-seven percent (37%) utilized exploratory qualitative method.

Several studies were conducted on teachers' and students' conceptions of assessment in the middle and secondary schools, in higher education and in teacher education institutions. However, literature shows that there is a dearth of qualitative exploratory researches which probe teachers' and students' conceptions of science learning assessment particularly of Physics Learning Assessment (PLA). Hence, this study aims to contribute to the further understanding of teachers' and students' conceptions of PLA through their perspectives in conceptualizing and reconstructing their experiences (Gipps, 1999). This is believed to be instrumental in revealing the importance of understanding how a student's personal interpretation, anticipations and preconceived notions about classroom processes, required tasks and standards relate with how he or she responds to these (Aikenhead, 1997). The study describes qualitatively the different ways of understanding, beliefs and experiences of Physics learning assessment of selected senior high school physics teachers and students. Physics Learning Assessment refers to all forms and types of assessment (formative and summative; formal and informal) that are used by the teachers in their General Physics 1 class in the Senior High School (SHS).

In describing the SHS teachers' and students' ways of understanding PLA, the dimensions of understanding that are focused on are referred to as knowledge, purpose and process. The knowledge dimension focused on teachers' and students' understanding of what PLA is. Purpose focused on teachers' and students' understanding of why PLA is given. And, the process dimension is centered on teachers' and students' understanding of how PLA is given. These dimensions of understanding are adaptations with modification of Mansilia's and Gardner's (1998) four dimensions of understanding in their Teaching for Understanding (TfU) framework: knowledge, method, purpose and form. The study also describes teachers' and students' beliefs about effectiveness and efficiency of PLA, as well as their significant interpretations of their PLA experiences.

This study adopts the phenomenographic paradigm of Marton and Booth (1997) and the social constructivist perspective of assessment in the analysis (Hein, 1991; Adamson, 2006). Marton (1994) defined phenomenography as: "the empirical study of the differing ways in which people experience, perceive, apprehend, understand, conceptualize various phenomena in and aspects of the world around us". In physics education researches, phenomenography has been utilized in describing the qualitatively different conceptions of students of a particular Physics lesson, principle or concept. In this study, phenomenography is used to explore and describe the SHS Physics teachers' and students' personal conceptions, through their ways of understanding, beliefs and experiences of PLA.

The researcher introduces the following modifications in the conduct of this phenomenographic research: 1) data sources include transcribed interviews of teachers and recorded transactions during focused group discussions with students, classroom observations during a PLA session and analysis of assessments instruments administered by teacher informants; most phenomenographic studies use interviews only; and 2) a final stage, conduct of external check, is added, in addition to the three stages of data analysis, namely identification of conceptions, formulation of the categories of description, and construction of the outcome space, to enhance reliability of data.

Finally, the results of this study can be used in presenting a conceptual model for teachers' and students' levels of conceptions of PLA. The process that this study undergoes can also be a basis in proposing a conceptual framework for determining or evaluating the teachers' and students' levels of conceptions of PLA.

Statement of the Problem

This study aims to describe qualitatively the different ways of understanding, beliefs and experiences of PLA of selected SHS physics teachers and students.

Specifically, this study seeks answers to the following questions:

1. How do SHS teachers' and students' describe their ways of understanding PLA in the following dimensions:
   a. knowledge of it?
   b. its purpose?
   c. process of administration?
2. What are the SHS teachers' and students' beliefs about the effectiveness and efficiency of PLA?
3. What do the SHS teachers' and students' find significant in their lived experiences of PLA as inferred from their most significant stories, emotions evoked by and insights gained from these experiences?

4. What are the teachers' and students' categories of description of PLA?
5. What are the relationships between the teachers' and students' conceptions of PLA?

Significance of the Study

The results of this study can be used as basis in developing a conceptual framework which shows a process for determining and evaluating teachers' and students' levels of conception of PLA. Such framework may be helpful to educational researchers in conducting similar studies in physics or other disciplines. The modifications introduced in the conduct of this study offer alternatives to the currently existing methods of doing phenomenographic research. The modified method may be useful when the goal is to describe the qualitatively different meanings that participants give to their experience of a phenomenon. The modification attempts to increase the validity and reliability of the results of phenomenographic analysis (Sin, 2010).

The teachers' and students' conceptions of PLA that are revealed in this study can be a basis for a conceptual model of teachers' and students' levels of conception of PLA. This conceptual model may be utilized by teachers as points for self-reflection in evaluating their own level of conception of PLA. Consequently, this may be used in coming up with concrete plans of action for their continuing personal and professional development. It is believed that by reflecting on one's own conceptions, teachers may use the outcome of their reflection as basis for adapting or revising their teaching into something that responds to their students' needs.

The conceptual model of teachers' levels of conceptions of PLA may also be significant to school administrators. Knowledge on teachers' conceptions of assessment may prove helpful to school administrators in planning in-service faculty development programs, particularly in providing trainings on science learning assessment and learning assessment in general. Such information may also be significant to curriculum designers and professors of teacher education institutes in making the pre-service curriculum for future SHS science teachers more responsive to the needs of the time.

Finally, the data from this study may be utilized in identifying the sources of gaps and disparities, if any, between the "intended" and "implemented" assessment processes in Physics learning. Educational policy makers and curriculum designers may find the data of this study useful in designing and implementing programs that will reinforce the authentic meaning, essence and purpose of PLA.

Scope and Delimitation of the Study

The study was conducted in Davao City, Philippines during the first semester of school year 2017-2018, the year of the nationwide roll-out of the Grade 12 curriculum. The study's focus was limited to the conceptions of PLA of Grade 12 teachers and students in General Physics 1, a subject in the curriculum for the Science, Technology, Engineering, and Mathematics (STEM) strand in Senior High School. The purposively selected sample consisted of four (4) teachers -- two (2) from a public national high school and another two (2) from a private, sectarian high school; and four discussion groups each composed of eight (8) students. Eight students from one of the classes of the four (4) teacher-informants or a total of thirty two (32) participated in the focus group discussion (FGD). Data sources include transcribed interviews of the teacher informants, the recorded proceedings of the focus group discussions, classroom observations during a PLA session, and analysis of the administered assessment tools. The teacher interviews, FGDs, and classroom observations were limited to one session per teacher and focus group. The analyzed assessment instruments were only those willingly shared by the teachers.

CHAPTER 2

REVIEW OF RELATED LITERATURE AND THEORETICAL FRAMEWORK

This chapter contains two major parts. The first part reviewed studies related to the following: (1) teachers' and students' understanding of PLA; (2) teachers' and students' beliefs about PLA; and (3) teachers' and students' experiences in PLA. The second part discusses theoretical framework, including research gaps addressed by this study.

Related Literature

Teachers' and Students' Understanding of PLA

A review of the literature showed that there are limited studies which focus on different methods and types of PLA in assessing students' learning and understanding. Methods include strategies, techniques, tools and instruments of, while formative, summative, embedded and continuous refer to types of assessment.

In the September 2005 report of the Victorian Department of Education and Training's Assessment Advice of Victoria, Australia, three main purposes of assessment were described as follows: assessment of learning, assessment for learning and assessment as learning. Assessment for learning focuses on using gathered information in inferring about a student's proficiency level and basing one's decision in making certain adjustments in one's teaching practices for the actual needs of the learner. This purpose of assessment is essentially formative. Assessment as learning is centered on a student's own responsibility in keeping track of his or her learning progress through continuous reflection and monitoring. Insights gained from this are used by the student in setting their future learning goals. The same with the previous purpose of assessment, assessment as learning is formative in type. Assessment of learning is summative in type as this is done in order to utilize data and information about a student's learning in evaluating how much is achieved by the student relative to the set learning goals and standards (Victorian Department of Education and Training's Assessment Advice of Victoria, Australia, 2005).

Focusing on formative assessment, Black and William (1998a) emphasized that teachers need to have deep understanding of formative assessment. This way, teachers should be able to employ strategies to assist students identify the gaps between their present achievements and the desired goals. Sadler 1989 (cited in Black 2000) argued that formative assessment should equip students with significant tools to take charge of their own learning.

According to Gerace (2004), assessment of learning was used in assessing students' physics learning. It was usually utilized before getting into the formal instruction of a particular lesson or concept. The activities required students to: (1) explore naive concepts; (2) compare, predict, and discuss what will happen in each given situation, and actually carry out an experiment thereafter; (3) analyze and reason using concepts; (4) solve concept-based problems where students describe and assess how various concepts and principles could be applied; and (5) organize and interrelate groups of concepts (Gerace, 2004).

Although formative and continuous assessments are a relatively well-explored research area, traditional assessment practices continue to dominate in science and physics education (Tinell et al, 2017 citing Dickie, 1994). This was reinforced by the comprehensive review of Docktor and Mestre (2014) which indicated that the assessment practices in the Physics education context were largely focused on the summative mode. In other words, PLA was used primarily as a means of determining students' grades.

Several studies linked teachers' personal understanding and conceptions of teaching and the way they actually teach and design assessment. Brown (2004) and Pajares (1992) argued that the study of teachers' conceptions of assessment is important because teachers' conceptions of teaching, learning, and curricula influence strongly how they teach and what students learn or achieve. Moreover, Tittle (1994) proposed that teachers construct schemas or integrate representations from assessments into existing views of the self, of teaching and learning, and of the curriculum. From their survey of elementary school teachers, Cizek et al (1995) found that the there was a "highly individualistic nature of assessment practices". Many teachers seemed to have assessment policies based on their "idiosyncratic values and conceptions of teaching" (Cizek et al, 1995). Teachers used a wide variety of seemingly conflicting assessment types because they "eclectically held and practised transmission-oriented and constructivist models of teaching and learning" (Kahn, 2000). And yet, as individualistic as conceptions may appear, Van den Berg (2002) argued that they are quite social and cultural as conceptions are also "shared cognitive configurations or phenomena".

A framework for conceptualizing assessment by teachers was developed by Ryan in 1988. The framework consisted of three models of teacher conceptions of assessment, namely: (1) The empirical-analytic (or the "technical rationalist, logical positivist orientation") related to measurement-based, traditional approaches to assessment. (2) The interpretive (an orientation that aimed at understanding things in the context of the student) included alternative methods of assessment such as portfolios and concept mapping. Finally, (3) the critical theoretic (an orientation which centered on the eradication of oppression) included student self-evaluation and assessment rubrics that were collaboratively developed.

A case study conducted by Craw (2009) focused on teachers' conceptions of and the corresponding variations in implementing performance assessment practices in science in a relatively less urbanized high school setting. His study revealed that teachers believed science performance assessment as a tool in developing essential skills and competencies for the twenty-first century. Furthermore, teachers expressed an understanding that performance assessment in science, particularly in the laboratory, could be a source of signficant information about the level of proficiency of their students in class. This information was deemed helpful in improving their instruction, deciding on curricular issues and directing their professional development for their students' specific needs. However, Craw (2009) noted that together with these views and understanding about science performance assessment were crucial factors that impeded the prioritizing of the utilization of the said assessment. These factors were "teacher attitudes, background, experience, subject matter taught and lack of time". This study, therefore, showed that teacher experience could affect the manner and degree of performance assessment implementation. Up to what extent teacher experience affected the manner and degree of implementing performance assessment was not articulated in the said study.

A study done by Tan (2012), on the other hand, focused on the variation in teachers' conceptions of alternative assessment (AA) in Singapore primary schools. The results of the said study enabled Tan (2012) to categorize three conceptions of alternative assessment (or ways of experiencing AA). The three ways of experiencing AA were: (1) conservative, (2) pragmatic and (3) progressive.

In Tan's (2012) study, teachers with the conservative conception viewed AA as an alternative to examinations. Their primary focus in teaching was to prepare their students to perform well in national examinations. Hence, AA was deemed as a distraction because it was viewed as "non-contributory to increasing their national examination scores" (Tan, 2012). Although these teachers acknowledged utilizing AA in their classes, they strongly expressed that they could only consider actually patronizing it if it would not hamper or slow down their students' preparations for the national examinations. This conception highlighted AA as a supplementary tool to mainstream traditional assessments. On the other hand, Tan (2012) described the pragmatic conception as characterized by its focus on the need to continually improve the effectiveness of all assessments in achieving the targetted learning outcomes within their subject for a particular academic year. Teachers in this category of conception acknowledged the limitations of traditional assessment practices and viewed AA as one which complemented the other. These teachers designed and used AA to help those students who struggled in reaching their subject's learning standards through mere traditional assessment. Finally, the progressive conception of AA went beyond the conservative and pragmatic conceptions as it focused on developing lifelong learning skills and abilities across disciplines and beyond academic years. Teachers under this category of conception understood and maximized the utilization of AA in a manner that assisted the students develop enduring learning and understanding. In order to achive this, these kind of teachers were "commited to continuously change and improve their existing assessment practices, traditional and alternative, and at certain times collaborated with teachers from different disciplines" (Tan, 2012).

One of the recent related studies on science teachers' conceptions of assessment was by Wu (2016) in Foshan, Guangdong Province, China. Wu (2016) emphasized three additional characteristics of the teachers' conceptions. First, the teachers may hold several different conceptions of assessment at the same time. Secondly, the teacher's conceptions depended on particular contexts, hence, it was "collectively context-dependent" (Wu, 2016). This further implied that teachers may have varied conceptions in different contexts. Finally, the teachers' conceptions were greatly influenced by the National College Entrance Examination. A weak relationship between the teachers' conceptions of assessment and their actual instructional practices was revealed. Wu (2016) noted that teachers' classroom approaches were tremendously shaped by external factors, particularly college entrance exams that their students would be taking in the future.

Teachers' and students' conceptions of assessment within the Italian higher educational system were investigated by Pastore and Pentassuglia (2016). Results indicated a great level of confusion about assessment both for teachers and students. Teacher's viewed the purpose of assessment in general as 'accountability'. The teachers were encouraged to reflect on their answers. However, results showed teachers' shallow definition of assessment which was merely as measuring tool for their students' learning achievement. Higher education teachers were found to have a difficulty in distinguishing the difference between formative and summative assessments. This prompted Pastore and Pentassuglia (2016) to note that "formative assessment was not sufficiently and deeply used in the context of the university" in their study. On the other hand, students appeared to be deeply motivated with collection of scores and grades, and did not give priority to their learning needs. They also perceived assessment as "not a meaningful and pleasant experience" (Pastore and Pentassuglia, 2016).

Still on higher education students' perceptions of assessment, the review of Struyven et al (2003) focused on the new modes of assessment. They emphasized that students' approaches to learning were heavily influenced by how they perceived assessment. On the other way around, students' approaches to learning may influence how they perceive assessment. Struyven et al (2003) found that educational researches indicated that among the traditional or conventional forms and types of assessment, students preferred the multiple-choice type over the constructed response or essay types. This assessment format was also found to result to "lower anxiety and complexity and higher expectations of success among students" (Struyven et al, 2003).

However, Struyven et al (2003) added that within the group of students some remarkable differences were found. Essay type of test were favored by students with good learning skills and low test anxiety rates. This assessment format was also found to go together with deep approaches to learning. When focusing on alternative assessments, students' perceptions revealed positive on new assessment strategies such as portfolio assessment, self and peer assessment and simulations. Moreover, Struyven et al (2003) found that alternative assessments were perceived by students as having a "positive effect on their learning and was fair and just when these were related to authentic tasks, required reasonable demands from them, provided real-life contexts as opportunities to apply their knowledge, required the development of wide range of skills and had impact that went beyond their school life".

The study of Tinell et al (2017), on the other hand, explored teachers' and students' Physics learning assessment perceptions in Physics postgraduate studies in Finland. In this research it was found that teachers recognized the need to lean towards authentic assessment modes, however, "the mode, timing and content of their actual assessment were stuck at being traditional". The emphasis was still on traditional approaches of measuring student performance as teachers perceived assessments as essentially equivalent to marking and ranking of student achievement. Tinell et al (2017) also explored the teachers' perceptions of the function or purpose of giving feedback. Two perceptions were revealed, namely: (i) "to lead towards discussion with a teacher on the basis of marking, and (ii) to help both teachers and students to better understand and make sense of assessment" (Tinell et al, 2017).

A study conducted by Brown and Hirschfeld (2005) focused on secondary school students' conceptions of assessment and its relationship to their actual curriculum-based performance. Four inter-correlated students' conceptions of assessment were revealed in the said study as follows: (1) assessment makes students accountable; (2) assessment is irrelevant because it is bad or unfair; (3) assessment improves the quality of learning; and (4) assessment is enjoyable. Among the four student conceptions, only the first (assessment makes students accountable) showed a positive impact on achievement while the last three had negative impact on achievement. The said scholars further explained that their findings were consistent with the theories of self-regulation and formative assessment which implied an increased performance among students who viewed assessment as one way of owning personal responsibility for learning (Brown and Hirschfeld, 2005).

There are ethical issues involved in classroom assessment. The most recent study on pre-service teachers' perceptions about ethical issues in classroom assessment was conducted by Liu et al (2016). The purpose of this study was to determine and describe the preceptions of pre-service teachers in the United States and China regarding ethical aspect of classroom assessment practices. Thirty-six scenarios about how teachers would act and think related to ethics and assessment approaches were given to the teacher participants. Results of the study led Liu et al (2016) to conclude that no apparent "global consensus about assessment and ethics" existed. Even within a certain country, teachers' views about ethicality of assessments vaired (Liu et al, 2016). As a whole, Liu et al (2016) found that among the thirty-six assessment scenarios, pre-service teachers from the United States of America and China differed in their perceptions of the ethicality of twenty-two (or about 61%) scenarios. The two aspects which showed great difference between the perceptions of teachers in the said two countries were on using peer ratings in determining students' grades and giving suprise items on a test. Pre-service teachers in the USA considered the two practices unethical while those from China perceived it to be otherwise (Liu et al, 2016).

In the attempt of this study to explore the teachers' and students' ways of understanding PLA, Mansilla and Gardner's (1998) dimensions of understanding, as presented by their Teaching for Understanding (TfU) framework, were anchored on. In this model, students were invited to put their understanding into action. Their performances allowed teachers to assess and orient their progress toward achieving understanding goals. Teachers were believed to confront the challenge of assessing their students' work. Mansilla and Gardner's (1998) TfU responded to the need for a framework for assessing students' understanding "within and across disciplines".

For their framework to be relatively "generic, applicable and systematic in its approach", Mansilla and Gardner (1998) highlighted four dimensions of understanding, namely: knowledge, methods, purposes and forms. The following paragraphs discussed the four dimensions of understanding which were anchored on and contextualized for the dimensions of teachers' and students' (SHS) understanding of Physics Learning Assessment (PLA).

Mansilla's and Gardner's (1998) knowledge dimension of understanding focused the assessment of a student's proficiency in transcending from their "unschooled perspectives, beliefs, and theories" about things and experiences around them to a richer, more logical and sensible ones. This dimension also looked into a student's extent of flexibility in fine-tuning his or her 'early intuitions' in order to achieve a deeper understanding of the world (Mansilla and Gardner, 1998).

The second dimension of understanding in Mansilla and Gardner's (1998) TfU framework was 'methods'. This dimension of understanding was focused on assessing a student's ability to evaluate available methods and choosing what he or she thinks are the most reliable ones in validating claims and works as "accurate, moral, or of aesthetic value" (Mansilla and Gardner, 1998).

The third dimension of understanding by Mansilla and Gardner (1998) was 'purposes'. This dimension focused on assessing the ability of a student to recognize the reasons or pruposes and driving factors that lead toward the construction of knowledge and learning (Mansilla and Gardner, 1998). This dimension also looked into a student's proficiency in utilizing his or her learning in different situations and recognizing the consequences of such application (Mansilla and Gardner, 1998).

The fourth and final dimension of understanding by Mansilla and Gardner (1998) was the 'forms'. This dimension paid special attention to "the forms in which understanding is performed and the process by which it is communicated to others" (Mansilla and Gardner, 1998) . The forms dimension assessed students' use of symbol systems (i.e. visual, verbal, mathematical, and bodily kinesthetic) in expressing their knowledge and learning. The expression of knowledge may be through 'essay writing, performing a musical, giving a presentation or explaining an algorithm'. Because of its communicative nature, Mansilla and Gardner added that this dimension also highlighted the ability of a student to recognize audience and context as one of their bases in showcasing their performances.

As mentioned earlier, this study, however, focused on three dimensions of teachers' and students' ways of understanding PLA, contrary to Mansilla and Gardner's (1998) four dimensions. The sub-variables of understanding in this study, as anchored on Mansilla and Gardner's (1998) TfU framework, were: knowledge, purpose and process. The knowledge dimension of understanding focused on teachers' and students' personal understanding of 'what' PLA means. While Mansilla and Gardner (1998) used the knowledge dimension in assessing students' ability in going beyond and sharpening their 'unschooled theories and beliefs' about the world, this dimension of understanding was considered in this study as one which was focused on exploring how teachers and students perceived and described the meaning of PLA based on their personal theories, beliefs and perspectives of their experiences of the said phenomenon. In other words, the teachers' and students' shared personal accounts about their understanding of the meaning and description of PLA was highlighted in exploring this dimension of understanding.

The purpose dimension of understanding that was employed in this study explored the teachers' and students understanding of 'why' PLA is given. This dimension is related to Mansilla and Gardner's (1998) purposes dimension as it explored the teachers' and students' personal understanding of the essence and purposes of giving PLA. It also explored how teachers and students viewed the multiple reasons of giving PLA and the possible consequences of having such.

The third and final dimension of understanding in this study is related to the merged form of Mansilla and Gardner's (1998) methods and forms dimensions of understanding. This was the 'process' dimension which focused on exploring and describing the teachers' and students' understanding of the methods and processes that PLA must be conducted or practised. Implicitly, this dimension also explored their understanding of the ways, approaches, forms and symbols of expression of PLA. Hence, this dimension was a blended form of Mansilla and Gardner's (1998) methods and forms dimensions.

Finally, in the context of exploring teacher's and students' understanding of PLA, this study also resonated with Denzin and Lincoln's (2000) view of the subjectivity of knowledge. They argued that interpretive researchers give more emphasis and value to the subjective accounts of knowledge over the objective ones and a 'negotiated understanding' of an investigated and explored phenomenon. In this study, the teachers' and students' ways of understanding PLA were considered 'subjective accounts of knowledge' as these views were reflections of their ways of conceiving their lived experiences of PLA.

Teachers' and Students' Beliefs about PLA

This sub-section attempted to discuss studies which are significantly related, directly or indirectly, with teachers' beliefs about assessment in general and Physics learning assessment in particular.

A study that explicitly examined the relationship of teacher beliefs about assessment and teachers' self-reported assessment practices was conducted by Brown (2004) at New Zealand. In his study, primary school teachers' responses indicated that when teachers leaned more towards the belief that assessment was student's responsibility and accountability, the more traditional memory-recall, low-level thinking skills assessment practices were utilized. On the other hand, Brown (2004) contrasted that when assessment was viewed more as a tool indicative of school quality, the higher was the likelihood that teachers utilized assessments that measure deep learning. In addition to this, Brown (2004) noted that teachers' beliefs that assessments were for improvement and assessments were irrelevant drove the increased utilization of informal assessments. Another belief was that externally created measures of student accountability (i.e. standardized national examinations) would only cater surface learning, while internally-designed assessment practices result to development and improvement of deep learning skills and competencies (Brown, 2004).

Similarly, in Brown et al's (2009) study among Hong Kong primary and secondary teachers in the context of an assessment for learning project, their result indicated that when teachers tended to have an increased usage of diagnostic and improvement assessment practices, the more they believed that assessment was for improvement. A belief that assessments were for school accountability in helping students to perform well led to an increased usage of assessment tools that were largely intended to showcase that the school is hitting its goals. High ratings in externally-administered examinations were essentially viewed as indicator of a successful school self-evaluation. On the other hand, Brown et al (2009) also revealed another teachers' belief that assessments should be ignored. Teachers who had this belief of assessment expressed that they usually stick to their teaching plans and ignore exam items in their classes.

Lawrence and Pallrand (2000), with Luttenberg *et al* (2013) shared the same view that teachers play a key role in making educational reforms successful. They believed that there is a need for science teachers to acquire the capacity to design, use and interpret student performance data to successfully implement new assessments of educational reform (Lawrence and Pallrand, 2000).

In addition to the studies on the interrelatedness of teachers' beliefs and educational reforms, Brown *et al* (2015) studied the relationship and impact of an assessment policy upon Indian teachers' self-reported assessment beliefs and practices. Brown et al (2015) noted in their study that to increase the utilization of formative assessments and mitigate the negative impacts of external, standardized public examinations on students, India sought for an educational policy reform. They surveyed the extent of Indian teachers' agreement or disagreement with the varied purpose of internally determined school-based assessments or externally imposed public exams and how they actually practiced assessment in their classes. Results showed that teachers who agreed on the positive role of internal, school-based assessment were more inclined to actually using diagnostic or formative types of assessments. Indian teachers' also revealed belief on the need to encourage more teachers that the legitimate purpose of assessment must be emphasized on educational improvement (Brown, *et. al.* 2015).

Another study which considered the circumstances under which science teachers could respond positively and productively to educational policy reforms particularly in the area of science practical assessment (i.e. laboratory-based work) was done by Towndrow *et al* (2010). To understand what might be factors that link science teachers' assessment capacities and their professional development, Towndrow *et al* (2010) contrasted the approaches of Hong Kong and Singapore teachers in the context of implementing educational reforms in science practical assessments. They found that Hong Kong teachers tended to be more critical in examining the new policy and putting high value on what they learned from their own experiences. Towndrow *et al* (2010) added that the Hong Kong teachers' approach was focused on evaluating and transforming their current assessment practices into something that they thought best for their students' learning vis-à-vis the reform. On the other hand, Singapore teachers tended to focus more on refining their practices for the sake of complying with what was mandated (Towndrow *et al*, 2010). Overall, Towndrow *et al* (2010) concluded that reforms in assessment must be one of the primary bases in designing teachers' continual professional development and updating.

Moreover, Pajares (1992) and Skott (2015) had similar views on the difference between knowledge and beliefs. According to them, "knowledge implies a general consensus with regards to its value as truth", while beliefs are "a set of faiths that individuals have in connection to a particular topic" (Pajares, 1992). Furthermore, Skott (2015) described teachers' beliefs as "individual mental constructs, value-laden and subjectively true, being the result, relatively stable, of some significant social experiences and having an increased impact over teacher's interpretations and contributions in the context of their teaching". In this study, teachers' and students' beliefs about what makes an effective and efficient PLA were explored and described.

Teachers' and Students' Experiences in PLA

This part discusses studies that are related, directly or indirectly, with teachers' experiences in assessment, in general, or physics learning assessment in particular.

To better understand how new teachers' experience new curriculum and assessments in the face of standards-based reform, Kauffman *et al* (2002) interviewed fifty (50) first- and second-year Massachusetts teachers in ,selected public schools in the United States of America during the 1999–2000 school year. Kauffman *et al* (2002) reported teachers' experiences of receiving minimal support and guidance particularly on what and how to teach and assess with respect to the newly-implemented curriculum. This plight, Kauffman *et al* (2002) added, drove teachers to resort to various ways such as "using the internet, scouring libraries, getting ideas from other teachers and spending personal funds for their day-to-day school activities", to name some. This study of Kauffman *et al* (2002) implied that negative experiences of teachers during an educational reform may contribute to having an incoherent curriculum and thereby affecting student achievement and teacher retention. Since assessment plays a big role in a curriculum, this further implied that intended assessment approaches in an educational reform may not be what is actually implemented especially in the absence of concrete teacher support system (Kauffman *et al*, 2002). This study, therefore, showed how teachers' experiences in assessment and teaching-learning processes in general, influence their actual assessment practices.

In the study of Madsen et.al. (2016), phenomenographic interviews of physics faculty and department chairs were conducted to describe the experiences and perceived needs and wants of the said respondents with regard to the utilization of research-based materials. The results of their qualitative study enabled the researchers to identify four categories of descriptions of teachers' experiences with research-based assessments (RBAs). First, most of the teachers showed interest in utilizing RBAs. However, they expressed lack of knowledge on addressing practical aspects such as how to find and actually administer them. Second, several teachers had experiences with RBAs that led them to think the RBAs were limited in the context of measuring students' competencies that mattered to them. With this, teachers viewed RBAs as something that were not addressing their needs for assessment, hence, were deemed not applicable in their actual classes. Third, many teachers preferred to consult communities of other colleagues and experts in making sense of their students' assessment results. Madsen *et al* (2016) added that these teachers wanted to practice consultation and interaction with teachers from other schools to learn about how they do assessments in general and not just RBAs. Fourth, Madsen *et al* (2016) found that a number of teachers expressed wanting help with assessment in the wider context of accountability.

The same with the limited extent and number of studies that were pointed out earlier in this sub-section, related studies on students' experiences of PLA were found to be limited. This part attempted to cite and discuss available studies which are related, in one way or another, with the experiences of students in Physics learning assessment.

In the study of Scouller (2006), traditional assessment in the form of standardized multiple-choice questions (MCQ) were compared with assignment essays. Results of Scouller's (2006) study showed that students' experiences of multiple-choice question (MCQ) examinations led to surface learning approaches among students. This further resulted to students' perception of MCQ examinations as measuring only low-level thinking skills. Moreover, the same study showed a contradictory result which revealed an association between deep learning strategies employed and low performance in MCQ examination (Scouller, 2006). On the other hand, students' experiences of preparing their assignment essays more likely employed deep learning apprcaches among the students. This was perceived by students as assessing higher intellectual skills. Scouller (2006) added that students who got low performance results in the assignment essays employed surface strategies in writing them.

In the study of Pastore and Pentassuglia (2016) regarding college students' conceptions of assessment, experiences of high scores and grades in assessments were essentially equated to good and positive experiences. Pastore and Pentassuglia (2016) added that the obsession of these students to collect high marks implied that students give less priority to their actual need to truly learn and understand. This habit further implied that these students' experiences of assessment were not that meaningful and pleasant for them (Pastore and Pentassuglia, 2016).

Another qualitative physics education research on Physics learning assessment was conducted by Gioka (2018) where selected London secondary science teachers' extent of using assessment *for* learning (AfL) practices when teaching Physics theories and investigations were explored. According to Assessment and Reporting Unit Learning Policies Branch Office of Learning and Teaching (2005), AfL allowed teachers to gather data and information about a student's knowledge, perceptions and misconceptions and utilize these as bases for planning the curriculum holistically. This encouraged the students to reach for their maximum capacities and competence (Assessment and Reporting Unit Learning Policies Branch Office of Learning and Teaching, 2005). Based on data that were collected through classroom observations and interviews, together with students' written work, it was found that very few teachers were implementing PLA practices that belong to assessment for learning. One of the differences between the study of

Gioka (2018) and this study is the focus of Gioka (2018) on assessment for learning only while this study covered the other forms of assessments under the generic term PLA. Moreover, Gioka (2018) explored and described the extent of the science teachers' utilization of AfL as embedded in their physics teaching while this study described the teachers' and students' understanding, beliefs and experiences of PLA with all its components, forms and types.

Another dimension of experience that was explored in this study was based on the study by Forlizzi and Battarbee (2004). In their study, the relationship between human emotion and experience was highlighted. According to them, "human emotion is at the heart of any human experience". Forlizzi and Battarbee (2004) added that "the way people are disposed to act because of a certain experience, whether positively or negatively, are generally explained by existing standard theories of emotion". Central to understanding and communicating about what and how people experience a certain phenomenon is to consider their emotion (Forlizzi and Battarbee, 2004). Guided by this view, this study included the probing of teachers' and students' emotions that were evoked or felt in their shared most significant stories of experiences of PLA.

At this point, the selected studies that were either directly or indirectly related with this current study were discussed. As shown in the earlier sub-sections, most of the studies were on teachers' and students' conceptions of assessment in general, with no regard to a specific discipline such as Physics. Studies in PLA were usually focused on specific types and forms of Physics assessment instead of PLA in general. It was established that there is a limited number of qualitative studies that explored and described Senior High School Physics teachers' and STEM students' understanding, beliefs and experiences of PLA.

Theoretical Framework

Social Constructivist Perspective of Learning and Assessment

Theories of learning have direct implications on teaching and assessment (Assessment and Reporting Unit Learning Policies Branch Office of Learning and Teaching, 2005). In this sub-section, the social constructivist theory of learning and its two ancestor theories (*constructivism* and *sociocultural*) were discussed. The implications of the social constructivist view of learning on assessment in general was also presented.

Cobb (1994) highlighted the similarities of and differences between a purely constructivist view of learning and a purely sociocultural one (Vygotsky, 1978). Sociocultural theorists describe activity as humans' involvement in practices that are culturally organized. On the other hand, constructivists view activity as focused on an individual's sensory-motor and conceptual aspects (Cobb, 1994). Although these show different views of activity, both schools of thought agree that activity is at the core of learning and development (Cobb, 1994). Cobb (1994) further cited as example the emphasis of the pioneer of sociocultural theory of learning, Vygotsky (1978) on the central role of "social interaction with the more knowledgeable others in the zone of proximal development and the role of culturally developed sign systems as psychological tools for thinking".

While constructivists center its focus on how an individual student reorganizes mental constructs in the process of learning, sociocultural theorists posit that learning happens as a product of participating in cultural practices (Cobb, 1994). As a consequence, Hanks (1991) emphasized that sociocultural view of learning resort to social activities that give opportunities to students to get involved in the interactions with the more knowledgeable individuals (i.e. teachers, peers) over and above the mental and conceptual processes that are actually included.

Further comparison between the two theories of learning was done by Minick (1989). He stressed that while constructivists analyze mental activity in terms of conceptual processes within an individual, sociocultural theorists' building block of analysis is on the premise that an individual is always in social action.

James (2006) highlighted possibilities for the merging of the central ideas of the two theories for a more complete theory on learning. This resulted to a relatively more recent approach in learning which is called the 'social constructivist' perspective of learning (James, 2006). In other words, the blending together of the central and core elements of the two separate theories yielded a constructivist approach, in both theory and practice, which also highly considers the importance of the social dimension of learning. Hence, the advent of the term 'social constructivism'. This can also be viewed as a sociocultural theory framework that involves a "discursive shift to recognize the cognitive potential to explain how we learn new practices" (Edwards, 2005). In other words, whichever angle it may be viewed, whether a constructivist that has leaning towards sociocultural or the other way around, in essence it is 'social constructivism'.

As a relatively more recent theory of learning, teaching and assessment, social constructivists acknowledge the importance of social interaction and the more knowledgeable peers in shaping learners' experiences. Social constructivists believe that teachers mediate students' learning through assessment. Assessment is an integral part of teaching and learning. To help the students to progress in their learning, Berry (2002) noted that teachers and the 'expert-like' peers assist and guide the students in their zone of proximal development (ZPD). Another perspective of this was expressed by Packer and Goicoechea (2000). Both scholars explained that in a social constructivist view of learning, acquiring understanding and expertise necessitate an individual's participation and interaction in a social activity, consequently transforming himself or herself and the social world. Stobart (2008) added that social constructivists give high premium to maintaining the balance between the two aspects of learning which are as an organized cultural activity and as an individualized meaning-making.

Consequently, the social constructivist view of learning led to the current perspective of assessment that highly prioritizes on "monitoring the entire process and products of learning" (Birenbaum, 2000). The said view also promotes a culture in assessment which considers assessment as an integral component of the teaching-learning process, Birenbaum (2000) added. Moreover, Kulieke et al (1990) described the characteristics of assessment tradition prior to the social constructivist perspective as follows: decontextualized; lacked variety in modes of measurements; focused on assessing low-order thinking competencies; assessed limited dimensions of intelligence; polar or isolated; and teacher-centered. The same group of scholars concluded that with the advent of the social constructivist perspective of learning, the shift was directed to an assessment culture which have the following characteristics: authentic and contextualized or based on the real-life context of the student; employs a number of measures to determine a student's learning style(s); puts high value on assessing high-order thinking capacities and the multiple intelligences; approaches assessment as integrative with the teaching-learning experience; and with increased student responsibility in the entire assessment process (Kulieke et al, 1990).

Finally, social constructivists put a premium on social and cultural factors to emphasize that these are tremendously essential to the construction and formulation of understanding (Adamson, 2006). Learning is basically and primarily a social process (Shepard, 2000). A cornerstone principle in this paradigm is the belief that in a learning encounter, students already bring with them implicit theories and mental constructs which came from the social environment that they are in (Sutherland, et al, 2004). Moreover, Sutherland et al (2004) added that these cultural contexts carried by the students were also developed and shaped with the help of 'inter-psychological aspects of knowledge creation'.

In Silcock's (2003) view, learning in the social constructivist perspective is considered 'dual-agentic' which emphasized the roles of the teacher and the learner in constructing the 'socio-cultural realm'. Should one aim to explore, describe and understand teachers' and students' conceptions, particularly their ways of understanding, beliefs and experiences of a certain educational phenomenon such as Physics learning assessment, it is imperative to consider the profile contexts that they are in (Adamson, 2006). In this study, to describe and understand the context of the selected Senior High School teachers and students in relation to their ways of understanding, beliefs and experiences of Physics Learning Assessment, their profile characteristics were determined (Keesing, 1974; Shumba, 1994).

Phenomenography

Phenomenography is defined as: "the empirical study of the differing ways in which people experience, perceive, apprehend, understand, conceptualize various phenomena in and aspects of the world around us" (Marton, 1994, p. 4424). In the 1970s, Ference Marton, together with his colleagues at the University of Göteborg in Sweden, conducted several studies on the learning outcomes of first year college students. Their inquiry was based on their observation that some students were better learners than others. This led to their qualitative investigation of "the variation between the students' learning outcomes, quality of the learning process and its implications" (Marton & Booth, 1997; Rands and Gansemer-Topf, 2014). Their studies led them to discover that the qualitatively different ways of students in understanding a certain text could be saturated to a certain limited number of ways. They also found that students' descriptions of their approach to learning the text demonstrated "a progressive range of ways students conceptualized their learning activity, from low-level processing such as memorization, to high-level processing such as applying knowledge to a real-world context" (Rands and Gansemer-Topf, 2014 citing Entwistle, 1997; Limburg, 2008; Micari et al., 2007). Marton (2000) discovered through these initial studies, that how a student personally gives meaning and value to a certain learning experience given to him or her is fundamental to his or her search for answers (Rands and Gansemer-Topf, 2014). Marton and his team encountered an ontological question, "What kind of thing is an experience"? (Marton, 2000, p. 104). This question led to the establishment of phenomenography as a research paradigm (Rands and Gansemer-Topf, 2014).

Moreover, phenomenography focuses the investigation at the "variation in people's ways of understanding the phenomenon instead of being directed solely at the phenomenon" Marton and Booth, 1997). When applied to the context of educational researches, phenomenography posits that the way students conceptualize their experiences with learning is related to the variation in their learning outcomes (Entwistle, 1997; Marton & Booth, 1997). In other words, how one deals and acts on a given situation or phenomenon describes the way they experience or conceptualize the phenomenon (Marton & Booth, 1997). Phenomenography, therefore, is centered on the conceptions of people of a certain phenomenon (Rands and Gansemer-Topf, 2014). This major tenet of pheneomenography is referred to as a *second-order perspective* (Marton, 1981). In this perspective, the researcher ensures that his or her own personal interpretation must be impermeable to make sure that it is the participant's reflection of his or her lived experiences that emerges in the analysis instead of the researcher's.

The above perspective was adopted in this study because of the assumption that teachers and students may have different understanding, beliefs and experiences about Physics Learning Assessment that they have collected through and from the different aspects of their lives (Motlhabane, 2016). These conceptions of PLA may have an effect on how they perceive, approach and relate to the Physics teaching-learning experience (Rands and Gansemer-Topf, 2014). The second order perspective helped to ensure that these varied personal and collective conceptions of the teachers and students of PLA be considered at the center of analysis. While listening to the teachers' and students' shared personal accounts of things, the researcher had to give clarifying and confirming questions when some parts of the shared thoughts and stories were not clear.

The other philosophical tenet of phenemenography is the adoption of a *non-dualistic perspective.* Ornek (2008) explained this perspective as considering the object (the phenomenon) and the subject (the person) as "not separate and independent of each other". The phenomenon cannot be isolated from the manner at which it is experienced or understood (Rands and Gansemer-Topf, 2014). In this study, the teachers and students (the subject) and their understanding, beliefs and experiences of Physics Learning Assessment (the phenomenon) were not separate and independent of each other. Although a phenomenon, Physics Learning Assessment in this study for instance, can be perceived in a number of ways, Uljens

(1996) and Ekeblad (1996) pointed out that only a limited number of ways of understanding will remain in the process of meaning-making.

Emphasizing the primary aim of phenomenographic paradigm which is to uncover the participants' understanding of a phenomenon and toward experiential description, participants were encouraged to do self-reflection on their lived experiences, or "awareness" (Entwistle, 1997; Marton, 2000). This centrality on "awareness" or "consciousness" (Marton, 2000) is another tenet of the phenomenographic paradigm. Boon, Johnston and Webber (2007) expounded that central to a phenomenographic study is to unravel the aspects of a subject's experience that are "personally deemed most meaningful and significant". These are aspects that are placed by the subject at the center of his or her awareness as a certain experience is recalled from memory and reflected on. These are believed to be what 'focal awareness' is composed of (Boon, Johnston and Webber, 2007). Johanssen et al (1985) explained this concept of discovering a subject's focal awareness as trying to describe how a subject sees or perceives an experience or a surrounding or '"perceptual world" instead of attempting to describe his or her mind and being. This analytical paradigm was deemed appropriate to anchor on by this study because of the goal of describing the qualitative ways of understanding, beliefs and experiences of teachers and students of PLA. This study explored how the teachers and students perceive their experiences of PLA, thereby, discovering their understanding and beliefs, or collectively, their conceptions of PLA.

Furthermore, analysis is an iterative, interpretive process in which the researcher repeatedly visited the data on a subject's shared accounts of his or her lived experiences to describe "distinctly different ways of experiencing the phenomenon" (Cope, 2004). The analytic process was conducted using solely the subject's perspective of his or her experiences of the phenomenon (Cope, 2004). For a researcher to keep guard of his or her own perspectives and personal inclinations and interpretations, clarifying questions were given in order to ensure that the researcher, participants and informants arrive at a mutual understanding of the shared personal accounts (Orgill, 2002).

Several phenomenographic researchers adopted the structure of awareness as an analytical framework in describing different ways of experiencing a phenomenon (Cope, 2004 cited Booth & Ingerman, 2002; Cope, 2002; Marton & Booth, 1997, as examples). It is believed that by underpinning all aspects of the phenomenographic research with the said framework, "ensuring validity and reliability becomes a straightforward task" (Cope, 2004).

There exist two models of the structure of awareness. The first and earlier one was by Gurwitsch (1964) and another relatively more recent similar one was by Marton and Booth (1997). In Gurwitsch's (1964), the structure of awareness was modeled as having three overlapping areas which are *the margin*, *the thematic field* and *the theme*. According to this model, when an individual is pondering on a certain phenomenon at a particular time and context, his or her "awareness is likely to consist of aspects of the phenomenon triggered by the context" and these collectively comprise the *thematic field*. The other non-related aspects of a phenomenon which the individual gives less focus into are what comprise the *margin*. From the simultaneously present aspects of a phenomenon in the thematic field, related aspects emerge out of these as being the point of focus or the *focal awareness*. These comprise the *theme* in the structure of awareness (Gurwitsch, 1964).

In Marton's and Booth's (1997) model of the structure of awareness, Gurwtisch's (1964) *margin and thematic field* was collectively referred to as the *external horizon* while the *theme* corresponds to the *internal horizon*. The external horizon consists of "all aspects that are part of awareness at a particular instant but which are not thematic" (Cope, 2004). On the other hand, the internal horizon "consists of the aspects of the phenomenon simultaneously present in the theme of awareness, and the relationships between these aspects and the phenomenon as a whole" (Cope, 2004). Both models essentially shared a common structure of awareness but only used different names for each part. In this study, Marton and Booth's (1997) model of structure of awareness was adopted. The researcher identified and saturated the aspects in the focal awareness (external horizon) of the teachers and students as expressed in their utterances about their individual understanding, beliefs about and experiences of PLA. Once the aspects in the focal awareness of the teachers and students were determined, these were grouped according to their similarities and differences. The utterances of the teachers and students were "combined to form a pool of meaning with regard to the phenomenon" which in this study is PLA (Booth, 1992). Consequently, the central themes, categories of description or conceptions of PLA emerged (internal horizon).

Marton and Booth's (1997) phenomenographic approach included three stages: (1) 'conception' where the variations of the experiences and ways of understanding are described; (2) 'categories of description' that highlight the similarities among the variations or the collective conceptions and (3) the 'outcome space' which is a visual or qualitative diagram which shows the interrelationships among the categories of description or 'the logically structured complex of the different ways of experiencing an object'.

Furthermore, Webber and Johnston (2015) emphasized that the phenomenographic analysis had to reveal two things: (1) the *referential aspect* (the "*what*") and (2) the *structural aspect* (the "*how*"). The referential aspect describes qualitatively "what is being experienced" or "what a phenomenon means" to the subjects. The result of this aspect are the *categories of description*, each category describing one conception. The structural aspect qualitatively describes "how the phenomenon is experienced". This is expressed through the *outcome space* which is the final output of a phenomenographic analysis. The outcome space visually shows how the categories of descriptions are related with one another, usually hierarchically (Marton and Booth, 1997). When applied in this study, the categories of description that collectively described the teachers' and students' ways of understanding, beliefs about and experiences of Physics Learning Assessment were revealed. Moreover, how these categories of description related with one another, how they vary and agree based on the profile characteristics of the involved teachers and students, were expressed through the outcome space.

Phenomenography as an analytical method approach was adopted in some physics education researches (PER). This was done to describe the qualitatively different conceptions of students in a particular Physics lesson, principle or concept (Ornek, 2008; Madsen et al, 2015; Özcan, 2010; and Motlhabane, 2016). One of the recent PER that was close in likeness to this study was conducted by Madsen et al, (2016) where phenomenographic interviews of physics faculty and department chairs were conducted to describe the qualitatively different conceptions or perceived needs and wants of the said respondents with regard to the utilization of research-based materials. The results of their qualitative study enabled the researchers to identify four "families of issues that faculty have around research-based assessments (RBA). "First, many faculty are interested in using RBAs but have practical needs around how to do so. Second, many faculty think that RBAs are limited and don't measure many of the things they care about,or aren't applicable in their classes. Third, many faculty want to turn to communities of other faculty and experts to help them interpret their assessment results and suggest other ways to do assessment. Fourth, many faculty consider their courses in the broader contexts of accountability and their departments" (Madsen, *et.al.* 2016).

The similarity between the study of Madsen et al (2016) and this study was that both involved Physics teachers, utilized phenomenography in the analysis and focused on teachers' conceptions of PLA. On the other hand, the differences were the following: this study also involved students who were taking Physics while that of Madsen et al's (2016) included department chairs or administrators; and this study considered PLA as encompassing all forms and types of Physics assessments while the study of Madsen et al (2016) was only limited to a specific type of PLA which was the research-based assessments (RBAs).

Finally, in this study, the phenomenon that the teachers and students were asked to contemplate into was Physics Learning Assessment, particularly their understanding, beliefs and significant experiences which collectively compose their conceptions of it. Thompson (1992) initially introduced the term *conception* as referring to "general mental structure, encompassing beliefs, meanings, concepts, propositions, rules, mental images, preferences, and the like". This study agrees with Thompson (1992) that beliefs are considered to be a subcategory of conceptions. Barnes et al (2015) also described conceptions as the teachers' "overall perception and awareness of assessment" in the context of national assessment conceptions. Anchoring on these studies of what conception is, this study described and utilized 'conception' as the composite of the teachers' and students' ways of understanding, beliefs about and experiences of PLA. Understanding, beliefs and experiences were considered as sub-categories of conception. Through the lens of phenomenographic analysis, the aspects in the focal awareness of the teachers and students in these three sub-categories of conception were collectively considered in the formulation of the *referential* (categories of description) and *structural* (outcome space) aspects of their conceptions of PLA.

Synthesis of Research Gaps

Although several studies were conducted on teachers' and students' conceptions of assessment in the middle and secondary schools (Aydeniz, 2007; Brown and Hirschfeld, 2008; Peterson and Irving, 2008; Correia, M.S. and Freire, A.M. 2014; Opre, 2015); in the higher education (Struyven, Dochy, and Janssens, 2002; Fletcher et al, 2012; Delfino and Magno, 2012; Pastore and Pentassuglia, 2016) and in the teacher education institution (Dayal and Lingam, 2015), teachers' conceptions of assessment received limited attention from science educators (Aydeniz, 2007; Genc, 2005). Moreover, the identified studies were focused on assessment in general without specifying a particular discipline like Physics.

For studies which looked into Physics learning assessments, specific PLAs were focused into instead of considering PLA as an umbrella term for all forms and types that were used in Physics instruction (Scouller, 2006; Kauertz and Fischer, 2006; Larkin, 2011; Ringenberg and VanLehn; Gerace, 2004; Thornton and Sokoloff, 1998; Ling, 2016; Ingec, 2008; Hanif et al, 2008; Tinell et al 2003; and Struyven et al, 2003). These implied that there is a dearth of phenomenographic exploratory researches which probed on and described teachers' and students' conceptions of Physics Learning Assessment (PLA) in a general sense.

In the Philippine basic education context, since the Senior High School (SHS) curricula of Grades 11 and 12 have just been recently implemented, no studies were found which investigated on how the senior high school physics teachers and students understand, believe and experience Physics Learning Assessment (PLA). This was one of the primary gaps in the body of knowledge that was addressed by this study. Since the primary goal of this study was to explore and describe the ways of understanding, beliefs and experiences of teachers and students of PLA, phenomenographic analytical paradigm (Marton and Booth, 1997) was anchored on but with considerable enhancements.

Further theoretical contribution of this study was in exploring the teachers' and students' ways of understanding PLA in the following dimensions or sub-variables of understanding, namely: knowledge which focuses on what PLA is; purpose which focuses on why PLA is given; and process which centers on how PLA is done.

Another theoretical contribution of this study was in probing and describing the selected teachers' and students' beliefs about PLA effectiveness and efficiency. In exploring the ways in which SHS teachers and student experience PLA, three dimensions of experience were focused on, namely: most significant stories, emotions evoked during the significant experiences, and insights gained thereafter.

Through phenomenographic analysis, results of this study may be a basis for: (1) a conceptual framework that shows steps in evaluating the level of completeness of teachers' and students' conceptions of PLA; and (2) a conceptual model that shows the different levels of teachers' and students' conceptions of PLA.

CHAPTER 3

METHODOLOGY

This chapter presents the research design, sample, research instruments, and the procedures for data collection and analysis, used in the study.

Research Design

This study was an attempt to develop a conceptual framework for determining the levels of teachers' and students' conceptions of PLA. It employed the combination of exploratory-descriptive research design. A descriptive-exploratory design was deemed appropriate because the topic of the study is one with a "high level of uncertainty and is not yet well understood" (Van Wyk, 2017) considering the limited research on the topic; and its goal is to find accurate and valid representation of teachers' and students' understanding, beliefs and experiences of PLA. A semi-structured interview of four teachers and four focus discussion groups consisting of 8 students per group, were the sources of qualitative data. Figure 1 shows a visual of the phenomenographic research paradigm of this study.

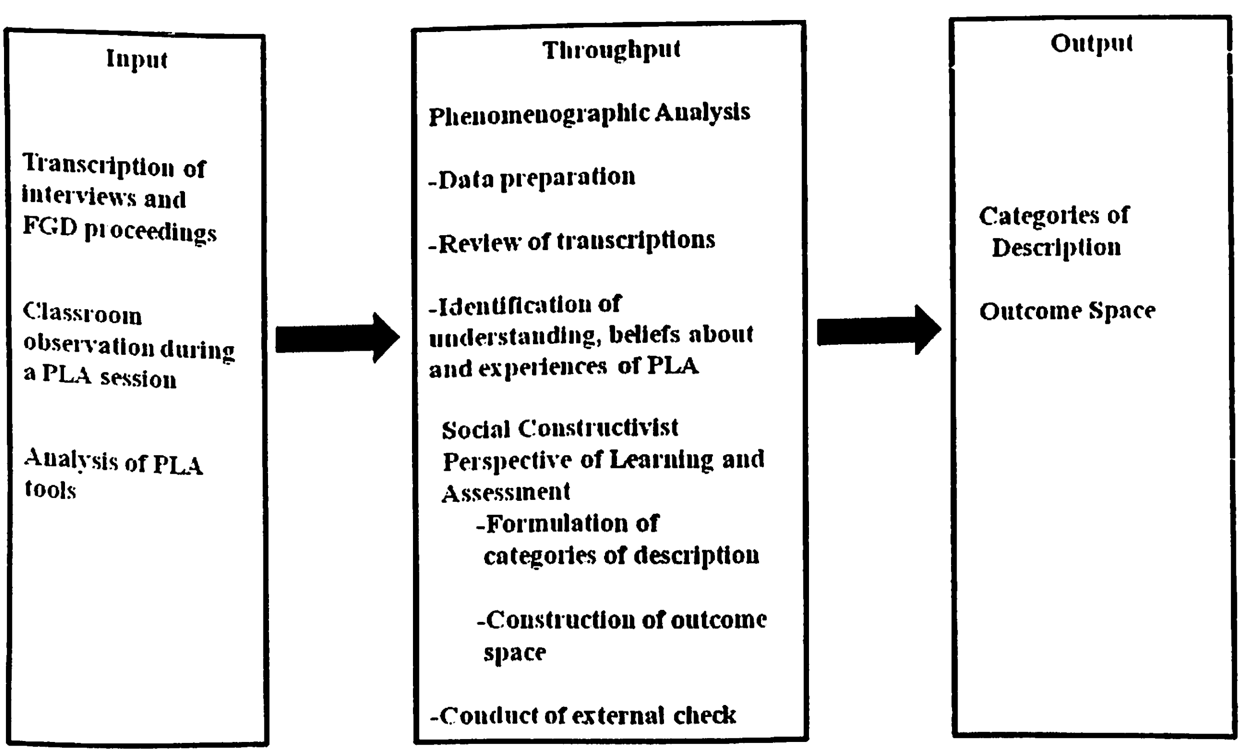

Figure 1 The Research Paradigm

As shown in Figure 1, phenomenographic analysis (*through put*) by Marton and Booth (997), specifically the structure of awareness analytic framework (Cope, 2004), was modified and used in analyzing the qualitative data (*input*) on teachers' and students' shared accounts of their PLA understanding, beliefs and experiences. In evaluating the level of completeness of their conceptions of PLA, the social constructivist perspective of learning and assessment (throughput) was anchored on in coming up with the categories of description and outcome spaces (output).

The Sample

Four (4) Senior High School (SHS) teachers and thirty-two (32) Grade 12 students (distributed into four (4) focus discussion groups) of the Science, Technology, Engineering and Mathematics (STEM)-specialized subject, General Physics 1 were purposively selected to comprise the sampie of the study. The criteria in purposively selecting the teacher-informants were the following: (1) type of senior high school where one teaches (either public or private SHS); and (2) subject taught (General Physics 1) during the first semester of school year 2017-2018. Table 1 summarizes the profile characteristics of the teachers. This is followed by a discussion of the profile of each of the four teachers. Codes names were assigned to the teachers in response to the ethics of anonymity and confidentiality.

Table 1 Teachers' Profile Characteristics

Profile Characteristics	Frequency (n =4)	Percentage
Gender: Male Female	4 0	100%
Age: 20 - 25 years old 26 - 30 years oid 30 - 35 years old	1 1 2	25% 25% 50%
Civil Status: Single Married	2 2	50% 50%
Highest Educational Attainment Baccalaureate Degree Masters Degree	 2 2	 50% 50%
Professional License Licensed Professional Teacher None	 3 1	 75% 25%
In-service training attended 12 – 5 months ago 6 – 12 months ago	 3 1	 75% 25%
Length of Teaching Experience 1 – 5 years 6 – 10 years	 2 2	 50% 50%
Type of SHS Public Private-Sectarian	 2 2	 50% 50%
Teaching Status: Full-time	4	100%
Employment Status: Probationary Regular	 2 2	 50% 50%

Table 1 shows that all of the teachers involved in this study were males. This was because there were no female physics teachers in the two SHS that participated in this study. Both teachers (A and D) from the private SHS (School Y) were on probationary status and have been teaching for less than five years. The two teachers (B and C) from the public SHS (School X) were both licensed professional teachers, in regular status and have been teaching between five to ten years. Concurrent with this study, both teachers were involved in conducting Physics content training for the SHS science teachers in their school district. The following paragraphs discussed the distinct profile characteristics of each teacher-informant.

Teacher A from the private SHS was the youngest among the four teachers and just passed the licensure examination for teachers during the conduct of this study. He finished Bachelor of Science in Secondary Education, major in Physical Science. He was still on his second year of teaching during the conduct of this study.

Teacher B from the public SHS was the only one who finished two undergraduate programs which were Bachelor of Science in Physics Teaching and Electronics and Communication Engineering. He was the oldest among the four teachers and the only one who held an administrative position (as STEM Coordinator) during this study.

Teacher C was also from the public SHS and the only one among the participants who was taking up a doctorate degree in Physics Education during the conduct of this study. He was away for three years for study leave and had just returned to teaching as he participated in this study. Although he has been teaching between five to ten years, it was his first school year teaching at School X during this study. His previous school (Junior High School) was also government-run.

Teacher D from the private SHS was the only one among the four teachers who did not have a professional teacher's license during this study and had no plans of earning one in the next three years. He was also the only one who did not have a formal teaching training but finished Bachelor of Science in Applied Physics instead. Another distinct profile characteristic of Teacher D was his experience as junior research analyst in the industry prior to entering the academe. He was on his first year of teaching in the basic education during this study and taught introductory physics in the higher education after his industry practice.

For the student-participants in the FGDs, Krueger & Casey (2000), suggested that the number of focus groups may be at most four for a simple research question and the number of participants in each group be between six and eight on the premise that smaller groups show greater potential. However, Rabiee (2004) argued that a manageable focus group size that is large enough to reveal a variety of perspectives and small enough to maintain order should have between six and ten participants. Another potential problem in using FGDs that was taken into consideration in this study was the 'number of non-attenders' among the recruited FGD participants which was gauged by Rabiee (2004) as between ten and twenty-five percent (10%–25%). Hence the study settled for four (4) focus groups with eight (8) students each.

The members of focus groups were selected through homogenous sampling in consonance with the idea that "the uniqueness of a focus group is its ability to generate data based on the synergy of the group interaction" (Green et al, 2003) and that "the members of the group should feel comfortable with each other to engage in discussion" (Rabiee, 2004). To constitute the groups the researcher requested each of the teacher-informant to nominate eight (8) students from one of their General Physics I classes. The nomination was based on the teachers' professional and personal judgement of a student's ability to express one's thoughts articulately. This was believed to be significant in gathering context-rich data about students' understanding, beliefs and experiences of PLA (Krueger, 1994; Patton, 1990). The students were assigned pseudonyms, especially when their statements were included in the final report. Tables 2 to 5 show the summaries of the profile characteristics of the four FGD groups, A, B, C and D, respectively, to provide context to the results of the study.

Table 2 Profile Characteristics of FGD Group A (Private, School Y)

Profile Characteristics	Frequency (n = 8)	Percentage
Gender: Male	5	62.5%
Female	3	37.5%
Age: 19 - 20 years old	0	0%
17 - 18 years old	8'	100%
15 - 16 years old	0	0%
Civil Status: Single	8	100%
Scholarship Grants		
With grants	4	50.0%
Without grants	4	50.0%
No indicated response	0	0%
Awards in Junior High School		
Awardees	4	50.0%
Non-awardees	3	37.5%
No indicated response	1	12.5%
Basis in Choosing the STEM strand		
Personal choice	8	100%
Not a personal choice	0	0%
Plans After Senior High School		
Proceed to higher education	8	100%
No indicated response	0	0%
Attitude Towards Learning Physics		
Likes learning about Physics	8	100%
Dislikes learning about Physics	0	0%

The students under FGD Group A were under Teacher A in a private SHS. A distinct profile characteristic of Group A was that this was the only group which had more males than females. Half of the group were academic awardees during their Junior High School completion. All planned to proceed to college and six out of eight (or 75%) aspired admission to engineering and architecture programs. Everybody took the STEM strand based on personal choice and expressed that they like learning things about Physics.

Table 3 Profile Characteristics of FGD Group B (Public, School X)

Profile Characteristics	Frequency (n = 8)	Percentage
Gender: Male Female	4 4	50.0% 50.0%
Age: 19 - 20 years old 17 - 18 years old 15 - 16 years old	0 8 0	0% 100% 0%
Civil Status: Single	8	100%
Scholarship Grants With grants Without grants No indicated response	 1 7 0	 12.5% 87.5% 0%
Awards in Junior High School Awardees Non-awardees No indicated response	 3 5 0	 37.5% 62.5% 0%
Basis in Choosing the STEM strand Personal choice Not a personal choice	7 1	87.5% 12.5%
Plans After Senior High School Proceed to higher education No indicated response	8 0	100% 0%
Attitude Towards Learning Physics Likes learning about Physics Dislikes learning about Physics	3 5	37.5% 87.5%

The students under FGD Group B were students of Teacher B in School X, a public SHS. The two distinct profile characteristics of this group were the following: (1) the males and females were of equal number; and (2) had the least number of Junior High School awardees (only 3 out of 8). All of the four females planned to take engineering programs in higher education, specifically agricultural engineering (3 out of 4) and chemical engineering (1 out of 4). One male student wished to take civil engineering while another one planned for food technology. However, more than half of the group (5 out of 8 or 87.5%) expressed that they did not like learning about Physics.

Table 4 Profile Characteristics of FGD Group C (Public, School X)

Profile Characteristics	Frequency (n = 8)	Percentage
Gender: Male Female	2 6	25.0% 75.0%
Age: 19 - 20 years old 17 - 18 years old 15 - 16 years old	0 8 0	0% 100% 0%
Civil Status: Single	8	100%
Scholarship Grants With grants Without grants No indicated response	 0 7 1	 0% 87.5% 12.5%
Awards in Junior High School Awardees Non-awardees No indicated response	 8 0 0	 100% 0% 0%
Basis in Choosing the STEM strand Personal choice Not a personal choice	8 0	100% 0%
Plans After Senior High School Proceed to higher education No indicated response	8 0	100% 0%
Attitude Towards Learning Physics Likes learning about Physics Dislikes learning about Physics	3 5	37.5% 62.5%

FGD Group C belonged to a public SHS and under the physics class of Teacher C. Among the four FGD groups, Group C had the most number of females (75%) and the most number of Junior High School academic awardees (100%). These were the distinct profile characteristics of this group. Two out of eight students planned to pursue medical-related programs in higher education (i.e. Medical Technology and Nursing). Three students aspired for the Civil Engineering program, one for Sports Science but two did not indicate any plans. Similar to the other public SHS group (Group B), more than half of Group C (5 out of 8) expressed not liking to learn about Physics.

Table 5 Profile Characteristics of FGD Group D (Private, School Y)

Profile Characteristic	Frequency (n = 8)	Percentage
Gender: Male	3	37.5%
Female	5	62.5%
Age: 19 - 20 years old	1	12.5%
17 - 18 years old	6	75.0%
15 - 16 years old	1	12.5%
Civil Status: Single	8	100%
Scholarship Grants		
With grants	6	75.0%
Without grants	2	25.0%
No indicated response	0	0%
Awards in Junior High School		
Awardees	7	87.5%
Non-awardees	1	12.5%
No indicated response	0	0%
Basis in Choosing the STEM strand		
Personal choice	8	100%
Not a personal choice	0	0%
Plans After Senior High School		
Proceed to higher education	8	100%
No indicated response	0	0%
Attitude Towards Learning Physics		
Likes learning about Physics	8	100%
Dislikes learning about Physics	0	0%

FGD Group D was composed of students under Teacher D in School Y, a private SHS. Similar to Group C, there were more females than males in this group but still fewer than the former. Seven out of eight students received Junior High School awards during completion.A distinct profile characteristic of this group was their age range. This is the only group which had the youngest student (15-16 years old) and the oldest (19-20 years old). Another characteristic that was unique in this group was the students' aspired college program. This was the only group where all of the eight students planned to pursue medical-related programs (i.e. Medical Technology, Optometry, Biology and Nursing). All of the students in this group also signified that they like learning about Physics. This was similar to Group A which was also from the same private SHS as Group D.

Furthermore, the research locale was composed of two large SHS in Davao City, Philippines that offer the academic strand STEM (Science, Technology, Engineering and Mathematics). These two SHS were given the following pseudonyms, School X and School Y. This was to ensure that the ethic of anonymity of these schools was upheld, as part of the agreement with them.

School X is one of the relatively largest government-run SHS in the city. In school year 2017-2018 when the study was conducted, it catered to three (3) Grade 12 STEM sections at an average of forty-five students per class and there were two full-time General Physics 1 teachers. The General Physics class met for fifty (50) minutes per session and four days every week.

On the other hand, School Y is one of the relatively largest private-sectarian senior high schools within the research locale. It had twelve (12) Grade 12 STEM sections during the run of this study with an average of forty (40) students per class. The General Physics class had one and a half (1.5) hours or ninety (90) minutes contact time every session, twice a week, with another one and a half (1.5) hours for extended learning time once a week. School Y had four (4) full-time General Physics teachers.

The Instruments

There were four researcher-made instruments used in this study, namely: (1) Profile Sheet for Teachers (Appendix A); (2) Profile Sheet for Students (Appendix B); (3) Key-Informant Interview Guide (KII guide; Appendix C); and (4) Focus Group Discussion Guide (FGD Guide; Appendix D). The following paragraphs discuss each research instrument in detail.

Profile Sheet for Teachers

This research instrument was used in gathering data about the profile of the teachers in order to describe the contexts that they were in. It had three parts which focused on the teachers' personal, educational and employment background. The Personal Background part asked for the gender, age, and civil status of the teachers. The highest educational attainment, license and latest activity attended for professional development were the foci of the three questions for the Educational Background part. The last part was the Employment Background which focused on the teachers' number of years in teaching, type of teaching institution, current teaching status and employment status. Each teacher-informant was given a hard copy of this research instrument, together with the letter of invitation and informed consent, upon agreeing to participate in the study. The informants answered all of the questions by writing directly into the given hard copy and returning it to the researcher during the time of the semi-structured interview.

Profile Sheet for Students

The two parts of this research instrument were used to gather data about the students' personal and educational background. Data gathered through this research instrument provided the profile characteristics of the students that were needed for the context in the analysis. The Personal Background part had four questions which focused on determining the gender, age, civil status, and scholarship grant. The second and final part had five questions which were aimed at describing the students' awards received in their Junior High School, STEM as personal choice, plans after Senior High School, type of SHS, and attitude towards studying Physics. The same with the previously described research instrument, this was also given in hard copies to each of the student-participant, in addition to their letter of invitation to participate, parents' consent and student's informed assent. The accomplished student's profile sheet was returned to the researcher during the groups' FGD session.

Key-informant Interview Guide (KII Guide)

This researcher-made, interview guide (KII guide) was utilized in conducting the semi-structured interview for the teachers to ensure that the questions were standardized. It covered questions that were centered on the following key points of the teachers': (1) ways of understanding PLA in the following sub-variables of understanding which were knowledge, purpose and process; (2) beliefs about PLA in the aspects of effectiveness and efficiency; and (3) experiences of PLA through their most significant stories, emotions evoked and insights gained. The questions in the KII Guide were categorized into three major parts which were the: opening, main and wrapping-up. There was a total of fifteen (15) questions in this instrument which were covered in an hour up to an hour and a half conversation with each teacher-informant.

Focus Group Discussion Guide (FGD Guide)

Similar to the KII Guide, this research instrument was also used to gather data that would answer all of the five research questions of this study. The questions were parallel to those in the teacher-informants' KII guide. It also had three parts which were the opening, FGD proper and wrapping up.

In the attempt to establish content and structure validity of the four researcher-made instruments, these were submitted for review and scrutiny to the following faculty members of the Ateneo de Davao University: Dean of the School of Education for her expertise in students learning assessment; the former Assistant Dean of the Social Science Cluster, an expert in qualitative research designs; and the current Chair of the Physics Department for the physics education research perspective. (See Appendix E for the letter of request that was given to the three experts).

Based on their comments, suggestions and recommendations, some questions were removed and others rephrased into a simpler and more direct manner. These revisions were deemed significant in contextualizing the questions with respect to the level of psychological developmental stages and expertise in assessment of, the teachers and students in the study.

The common suggestion among the three experts was to rephrase the KII and FGD Guides questions using simpler words. As an example, instead of "What is your personal understanding of the meaning of PLA?", the question was rephrased into, "What comes into your mind when you hear the word assessment?". Then a follow up question on personal understanding of physics learning assessment based on their experiences of it in their General Physics 1 class was recommended. These recommendations were integrated in the revisions and enhancement of the instruments.

Then a pilot-testing was done to determine whether or not one's instrument would work in the actual setting. Pilot-testing also helps a researcher see if any questions make the informants and participants confused and uncomfortable. One is also able to find out how long it takes to complete the questionnaire, interview or FGD in real time (Center of Evaluation and Research, 2011).

For the Profile Sheet for Teachers and KII Guide (Appendices A and C, respectively), one General Physics 1 teacher from School Y (the private SHS involved in this study) who was not part of the sample of teacher-informants participated in the pilot-test. The teacher was male, full-time, with probationary status and with a teaching experience of less than five years. He was scheduled to take the Licensure Exam for Teachers on the same school year as the conduct of this study. An informed consent was obtained from the pilot teacher-informant (Appendix I) prior to the pilot interview. The pilot-testing of the KII guide was conducted on the first week of August 2017.

The pilot-test for the Profile Sheet for Students and FGD Guide (Appendices B and D, respectively) was conducted to a group of eight Grade 12 General Physics I students (with their parents' consent and students' informed assent) from School Y where the pilot teacher-informant was teaching. As mentioned in the earlier part of this section, School Y caters to more Grade 12 STEM sections (twelve) than School X (with three sections). Hence, the relatively larger size and accessibility of School Y prompted the researcher to choose it for the pilot-testing of the said researcher-made instruments.

The students who participated in the pilot-testing of the Profile Sheet for Students and FGD Guide did not belong to the classes of the actual teacher-informants from School Y but were under the supervision of the pilot teacher-informant. The pilot teacher-informant nominated these students from one of his General Physics 1 classes. The nomination was based on the best knowledge of the teacher as to who among his classes would probably make good participants in the pilot FGD in the aspect of being articulate and expressive of one's personal thoughts and ideas. This was employed to gather rich qualitative data, input and suggestions during the pilot-test of the FGD guide (Krueger, 1994; Patton, 1990). Moreover, parents' informed consent (Appendix J) and students' informed assent (Appendix K) were obtained from the recruited students prior to the pilot-test of the said instruments.

Prior to the actual pilot-test of the interview and FGD guides, the Profile Sheets for Teachers and Students were given to the pilot teacher-informant and student-participants, respectively. They were asked to fill these out in advance and return them to the researcher on the agreed time and place of the pilot-test. This was a simulation of the actual semi-structured interview and FGD during the data gathering. Moreover, the pilot-test of the four instruments were all administered by the researcher from the latter part of July 2017 until the first week of August 2017. The pilot-test of the semi-structured interview ended much earlier than expected (just about half an hour contrary to the projection which was an hour up to an hour and a half long) while the pilot FGD went on within the expected time. After the pilot-interview and FGD, the teacher and students were asked by the researcher to give their feedback and recommendations in order to make the instruments more understandable and clear to the actual informants and participants. Areas in the instruments which the pilot-informant and pilot-participants found confusing and unclear were revised and other questions were excluded. The pilot teacher-informant also suggested to the researcher more probing questions which could allow the researcher to explore more deeply into the teachers' conceptions of PLA. This valuable suggestion was considered by the researcher in the revised version of the KII guide.

Data Collection Procedure

The first part of the data collection procedure was sending the letter of permission to the School Division Superintendent (SDS) of the Department of Education, Davao City Office (Appendix L). This was done on the latter part of June 2018. After getting the approval of the said head office, letters of permission, attached with the approval document from the SDS, were sent to the School Principals of the two selected senior high schools in this study (Appendices M and N for School X - public SHS and School Y- private SHS, respectively). The approval from the said three educational leaders was accomplished by the end of July 2018.

During the first week of August 2018, the Informed Consent (Appendix H) and Profile Sheet for Teachers (Appendix A) were given to the four General Physics 1 teachers who were purposively selected and who agreed to participate in this study. The researcher and each teacher-informant set and agreed on the date, time and place of the semi-structured interview.

After identifying the shortlist of students with the help of the teacher-informants, the researcher informally asked these students whether or not they would be agreeable and willing to participate in this study. This was done during the vacant time of the students. Following the initial informal inquiry with the students, a formal orientation followed for the students who agreed to participate.

The orientation lasted for about ten to fifteen minutes per FGD group and included the researcher's discussion on the background, purpose, data gathering methods and students' part in the study. The Informed Parental Consent (Appendix F), Student's Informed Assent (refer to Appendix G) and Profile Sheet (see Appendix B) were then distributed to the students during the said orientation. Moreover, the orientation also gave the students the chance to ask the researcher questions for clarification. Finally, the group and the researcher agreed and set the date and time for the FGD.

The semi-structured interviews and FGDs were conducted from the second week of August 2017 until the last week of September 2017, first semester of school year 2017-2018. There were times when the set schedule for the interviews and FGDs were postponed to another time due to the teachers' and students' availability. There were also instances when it was due to some school and city holidays. Consequently, the semi-structured interviews and FGDs were limited to only one session per teacher-informant and FGD group respectively.

In the conduct of the actual semi-structured interviews, the researcher met each teacher-informant at the set date, time and place. The interview place was the school where the teacher teaches, particularly in a relatively comfortable, well-lit, well-ventilated and quiet spot in the school, as agreed by the informant and the researcher. For School X (public SHS), the interview was conducted at their main library, upon the permission of the head librarian. For School Y (private SHS), a vacant conference room was requested by the researcher for the FGDs. Moreover, the primary and sole interviewer was the researcher. The Informed Consent and Profile Sheet for Teachers were retrieved by the researcher from the teacher-informant at the onset of the interview. An attendance sheet was also accomplished by the former and the latter (Appendix O). The researcher gave her name, affiliation, title and purpose of the study. She also asked the permission of the informants to audio-record the interview session . They were assured that their identities and the information that they would share would be held confidential. Once the preliminaries were set, the interview commenced.

Participants of the study were encouraged to reflect on their lived experiences of PLA and orally express these to the researcher (Orgill, 2002), thus, data came in words and narratives of their own perspectives and conceptions.

During the interview, the researcher had some discretion about the order the questions were asked, and provided probes to make sure that the correct material was covered. The interview was conducted in a conversational and non-threatening manner to collect detailed information and to delve deeply into a topic to understand thoroughly the answers provided by the interviewees (Harell and Bradley, 2009).

Another major part in the interview process was referred to by the researcher as 'confirmation' component of the interview. This was when the researcher clarified, confirmed and validated that her understanding of the shared personal accounts was the same with the way the informant understood and conceived it (Orgill, 2002). This was done by giving clarifying questions like, "can you elaborate it more?", "have I gotten it right?", "is that what you are trying to say?" and the like. This was done in any part during the interview when the researcher saw the need. Moreover, this served as the owning of the informants of their shared personal accounts about their understanding, beliefs and experiences of PLA. This also enabled the researcher to consciously guard her personal biases and interpretation of the utterances of the informants and focus on the latter's interpretation instead (Marton, 1981). The main role of the researcher as an interviewer was to facilitate the interview, listen to the accounts and utterances of the informant and ask for clarifications when necessary. Comments that were judgmental and derogatory that may put the informant in an awkward position were never given. Cope (2004) referred to this practice of giving phenomenographic interviews as the 'intentional-expressive approach' where interviewees are encouraged to "reflect and confirm the intended meanings in the expressions that they have used". Svensson et al. (2006a) added that data gathered from intentional-expressive approach could be considered "objective as the meanings therein are from the interviewees' perspectives constituted by their own understanding of the phenomenon of interest". This adopted interview approach was one way of ensuring 'reflexivity', thereby, improving the objectivity of the gathered qualitative data through interviews (Cope, 2004).

After covering the questions that centered on the informant's understanding, beliefs and experiences of PLA, the last part of the interview was wrapping up. This was done by synthesizing what were discussed in the conversation and asking the informant if there was something else that he wished to add. When everything was done, the researcher expressed gratitude to the informant for his valuable contribution to this study. Audio-recording stopped at this point and refreshments and meal were served. The researcher and informant then agreed on the date and time that the researcher could observe the class during a PLA session.

Similar to the semi-structured interviews with teachers, the FGD sessions were conducted in a chosen spot in their schools which were deemed comfortable, well-lit, well-ventilated and quiet. For the two FGD groups in School X, it was a spot in their main library. For the other two FGD groups in School Y, the FGD was held in a small conference room.

The main and sole FGD facilitator was the researcher. Prior to the start of each FGD session, refreshments and snacks were served to the students. The accomplished Informed Parental Consent, Student Informed Assent and Profile Sheet were also retrieved by the researcher. The students and researcher signed up an attendance sheet before the start of the FGD proper. When everything and everyone were set, the FGD started.

The focus group dicsussion (FGD) with the students used the researcher-made FGD guide. The manner and approach of the FGDs were similar to the interviews in the context of being informal and non-rigid. Moreover, the researcher conducted the FGDs with utmost consciousness in covering all of the talking points in the FGD guide and ensuring that all of the participants were given appropriate time to express their points and thoughts.

After covering all the guide questions, the session was wrapped up in the same manner as the teachers' interviews. The participants were also thanked for their participation and valuable contribution to the study. The average length of the FGD sessions was seventy (70) minutes.

An issue that may affect the reliability of results was the frequency of conducting the semi-structured interviews and FGDs. Each of these data collection method was limited to one session per teacher and focus group. This was mainly due to the limited availability of the informants and the participants. Securing the approval and permission of the involved educational leaders to conduct the study took much longer than the researcher expected. Consequently, the data-gathering commenced late than the researcher projected. These factors led the researcher to conduct single-session interviews and FGDs. Even with this reduction, there were still some instances when the agreed time of interview or FGD was postponed to another date and time because of school or city holidays and teachers' emergency meeting or other functions. With the interview and FGD sessions limited to only once per informant and focus group, the gathered qualitative data was cross examined using other data sources which were classroom observations during a certain PLA and analysis of PLA tools. Hence, the data sources for the triangulation method were the semi-structured interviews for teachers, FGD for students, classroom observation during a physics learning assessment session and document analysis of shared General Physics 1 class assessment artifacts.

For the classroom observation which served as another data source in this study, the researcher observed the classes of the FGD groups during a given PLA only once. The main role of the researcher in this part of the triangulation method was as a passive observer. The following variables were the focus of the classroom observation: lesson, form and type of PLA, students' tasks and participation, forms and types of interaction between teacher and students and materials or resources that were utilized. Field notes were done with much emphasis on the researcher's observations and less on inferences.

For the document analysis, the researcher requested for the teacher-informants to share the artifacts for their formal and/or informal forms and types of PLA (i.e. sample quizzes, quarterly exams, drills, laboratory activities and any other kinds) that they were using in their classes. There was no instance that the teachers were forced or persuaded by the researcher with regards to the PLA materials that they were allowed and were willing to share with the researcher. For the document analysis, the researcher focused on the following variables: lesson covered, type and form of PLA (formal/informal; formative/summative), duration of time for the accomplishment of the PLA and the level of thinking skill it assessed.

Data Analysis Procedure

This section discussed the qualitative analysis through phenomenography of the teachers' and students' ways of understanding, beliefs and experiences of Physics Learning Assessment.

Phenomenographic Analysis

The phenomenographic method (Marton and Booth, 1997) was adopted and modified in this study. The original phenomenographic method was discussed in Chapter 2. The steps in the modified phenomenographic analysis are presented in Figure 2. The following stages were articulated and added into Martin's and Booth's (1997) phenomenographic analysis: Stage 1 Preparation of Data Sources, Stage 2 Review of Transcriptions and Stage 6 Conduct of External Check.

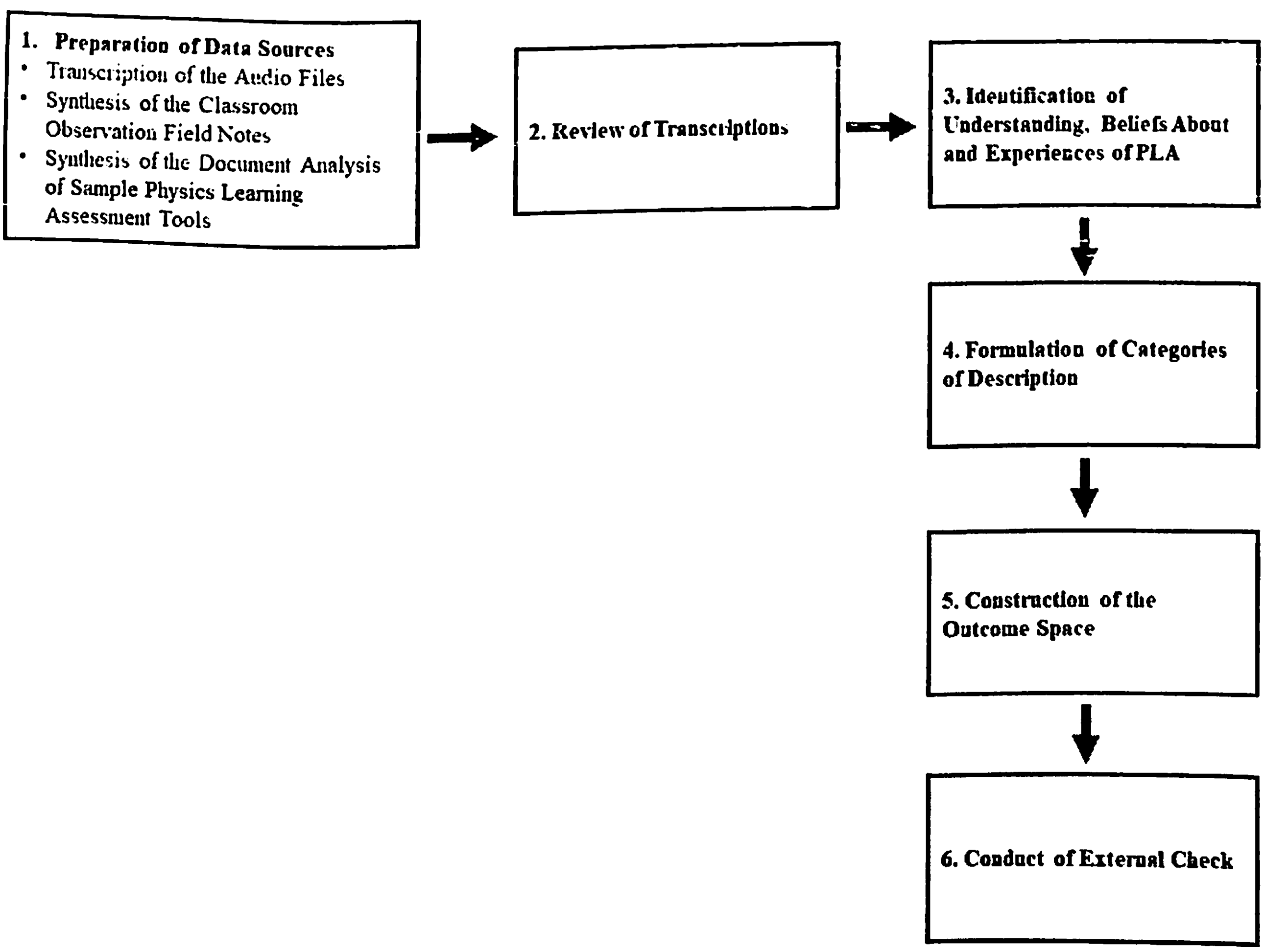

Figure 2 Stages of the Modified Phenomenographic Analysis

Preparation of Data Sources

This stage has three sub-stages which correspond to the three sources of data: transcription of the audio-files; synthesis of the classroom observation notes; and synthesis of the document analysis of the sample physics learning assessment tools.

- Transcription of the Audio-Files

The analysis of data immediately started when all of the semi-structured interviews of the teachers and the focus group discussions (FGDs) of the students were completed. Due to the bulk of the four interview and four FGD audio-files in this study, the researcher hired an external transcriptionist to do the verbatim transcriptions.

- Synthesis of the Classroom Observation Field Notes

Based on the field notes of the researcher from each class observation, synthesizing was done by summarizing the data for the following categories: lesson covered by the PLA, form and type of PLA, students' tasks and participation, forms and types of interaction between teacher and students and materials or resources that were utilized.

- Synthesis of the Document Analysis of Sample Physics Learning Assessment Tools

The sample PLA artifacts that were voluntarily shared by the teachers were reviewed and analyzed by identifying the type of assessment shown in each document (i.e. formative or summative; formal or informal; written or practical; traditional or authentic); the lesson it covered; time allotment; and the level of thinking skill it assessed.

Review of Transcriptions

The researcher conducted the review and repeated readings of the transcriptions in order to check for errors. The researcher did not do the transcriptions, hence, the usual causes of errors were primarily attributed to the external transcriptionist' unfamiliarity of the words and terms in Physics, the participants', informants' and researcher's unclear utterances, occasional unwanted background noise and technical glitches (Otero and Harlow, n.d.).

In this study, the English language is a second language to the teachers and students. They used their regional language and national language (Visayan and Filipino, respectively) in addition to the English language. The translation of the transcripts was done by the researcher who also speaks the same regional language as the informants and participants. There was no validation of the interview and FGD transcripts translations from the local language (Visayan) to the English language. This was due to the constraints of time and expert availability. The researcher did the literal and contextual translation.

Barnacle (2005) pointed out that there may be "aspects of experience that cannot be or are not expressed" in the written form of the spoken data. Thus, the researcher, repeatedly revisited the audio-files vis-à-vis the transcriptions, recollected and reflected on the notes manuscripts/scribbles done during the actual data collection.

Identification of Understanding, Beliefs About and Experiences of PLA

The transcriptions were divided into smaller, more manageable parts (Prosser, 2000) instead of taking them as a whole, for the identification of individual ways of understanding, beliefs about and experiences of PLA (Svennson, 1997). The researcher did a series of repeated readings of the interview and FGD transcriptions contemplating on the teachers' and students' utterances about their understanding, beliefs and experiences of PLA. The answers to the questions in the KII and FGD guides for the teachers and students, respectively, were listed, grouping together the similar ones. The similar answers were stated as one statement on understanding, belief or experience of PLA. The aspects in focal awareness or the most signficant element in each of the the participants' statements were then identified.

The field notes from the class observations and document analysis of artifacts were also revisited, noted and integrated and were used as additional points of reference in the identification of the aspects in focal awareness. The outputs, therefore, in this stage were statements of the teachers and students on their ways of understanding, beliefs about and experiences of PLA (external horizon). These served as answers to research questions 1 to 3.

Formulation of Categories of Description

The different statements on the ways of understanding, beliefs and experiences of PLA derived from the teachers' and students' focal awareness were sorted according to their similarities, differences and extent of being social constructivist in perspectives for the hierarchy. Those with similar foci of conception form one group and essentially comprise one category of description. The categories of description (internal horizon) from the teachers' utterances were formulated separately from those of the students'. Frequent revisits of the original transcripts, classroom visit notes and document analysis were still embedded in this stage showing the iterative process of this analytical paradigm.

Once the categories of description were formulated, metaphors or catchy titles were assigned to each category of description to emphasize the dimensions of variation (Larsson & Holmström, 2009).

Construction of the Outcome Space

In this stage, the researcher constructed a map called the outcome space to visually present the relationships between the teachers' and students' categories of description of PLA. The relationships were the hierarchy, similarities and differences between the categories. Two types of outcome space were designed by the researcher for clarity and simplicity of presentation. The first type highlighted the hierarchical architecture of the categories of description while the other type focused on similarities and variations. The outcome spaces were the final products of the phenomenographic analysis (Marton and Booth, 1997). "The hierarchy does not necessarily represent a transition from a worse state to a better state, but instead a transition from a less complete understanding to a more complete understanding" (Bucks and Oakes, 2011).

There is no definite rule in phenomenographic analysis that provides the standards for the visual presentation of outcome spaces. In this study, the first type of outcome space showed the least complete category at the bottom level and the other categories with higher levels of completeness of understanding at the higher position. Each category of description was visually represented by a geometric figure (rectangle). The second type of outcome space was a Venn diagram where overlapping regions depicted the similarities between categories while non-overlapping regions showed the distinct features of each category.

Conduct of External Check

The Presentation, Analysis and Interpretation of Data (Chapter 4) of this study which contained the categories of description, outcome space and excerpt quotes or utterances were submitted to external experts for further comments, suggestions and recommendations. This established the "interjudge communicability" of the analysis

(Cope, 2004). Other researchers referred to this as 'interjudge reliability' and utilized as a measure of reliability (Cope, 2000). Cope (2000) added that "the use of interjudge reliability in phenomenographic research has been described by Säljö (1988), as measuring "the communicability of categories and thus gives the researcher information that someone else can see the same differences in the material as he or she has done". Interjudge communicability, then, is "not a test of whether other researchers can come up with the same outcome space, rather, interjudge communicability can be used as a test of the reliability of the description of an outcome space and a meaningful contributor to ensuring the rigor of phenomenographic research approaches" (Cope, 2000). Hence, the conduct of external check was deemed as a response to this call for rigor.

In this study, two experts from the Ateneo de Davao Univerity, College unit were involved in the conduct of external check. Letters of permission were given to the experts (see Appendix R). One of the two experts is a former assistant dean of the Social Science Cluster and a full-time, regular faculty of the said university for seventeen years and a Doctor of Philosophy. He also teaches research in the Graduate School of the said university. He was tapped by the researcher for his expertise in social science, qualitative researches. He was also one of the three experts who conducted the review of the four research instruments (Appendices A to D) for enhancement and validation.

The other expert is currently the Chair of the Physics Department of the same university. He has been a Physics faculty for twenty-five years, a licensed Civil Engineer, with a Master's Degree in Physics and a Doctorate in Educational Management. His participation was requested for his Physics education background and his involvement in educational researches in the said university. He was also one of the experts who participated in the review of the four instruments in this study (Appendices A to D). After the two experts gave their comments and suggestions, particularly on the formulation of the categories of description and outcome space, the necessary revisions were done. Although these experts were the same ones who reviewed the researcher-made instruments of this study, this did not affect their role in establishing interjudge reliability because the approaches for and functions of research instrument review and external check of phenomenographic results were different from each other.

CHAPTER 4

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

The study explored the ways of understanding, beliefs about and experiences of PLA by teachers and students in general physics from two SHS. Data sources included information sheets, semi-structured interviews with teachers, FGDs with students, classroom observation during a PLA session and document analysis of PLA tools. This chapter presents the collected qualitative data, as well as, their analysis and interpretation arranged in parallel sequence with the five research questions.

Teachers' and Students Ways of Understanding PLA: Knowledge, Purpose and Process

The succeeding sub-sections expound on teachers' and students' ways of understanding PLA as gleaned from the researcher-determined aspects in focal awareness of the three dimensions of understanding PLA: knowledge, purpose and process. This sub-section addressed research question number one on teachers' ways of understanding PLA.

Teachers' Ways of Understanding PLA: *Knowledge* Dimension

Table 6 presents significant elements in the teachers' responses about the knowledge dimension of the ways of understanding PLA, labeled aspects in focal awareness. The statements in column 1 are descriptions of the idea or theme common to the grouped aspects in focal awareness in column 3. The second column indicates the specific teacher(s) who expressed the given way of understanding PLA.

Table 6 Teachers' Ways of Understanding PLA in the *Knowledge* Dimension

Teachers' Ways of Understanding of PLA (knowledge dimension)	Teacher(s) Who Expressed the Given Understanding	Aspects in Focal Awareness
1.PLA is a cyclic procedure outlined in the curriculum guide done by teachers to measure students' understanding in Physics.	Teacher A (Youngest; on his second year of teaching; from a private SHS)	*Structure of assessment in relation to adhering to existing policies *Teacher-centered PLA
2.PLA is through performance tasks which adddress th purpose of an educational reform.	Teachers B and C (Both teachers are from the public SHS and have been teaching between 5 to 10 years. Teacher B has an engineering degree and administrative position as the STEM Coordinator.)	*Structure of assessment in relation to adhering to existing policies *Summative aspect of PLA
3.PLA is a test of how much a student understands in Physics and is best done through laboratory experiments.	Teacher D (No formal education training and license for professional teachers but an Applied Physics degree and industry research practice.)	*Emphasis on application of learned concepts in real life *Summative aspect of PLA
4.PLA is designed to measure how much is learned or not learned with respect to a government-given curriculum guide.	Teacher C (takes a post-graduate degree in Physics Education concurrent with this study)	*Structure of assessment in relation to adhering to existing policies *Assessments of analytical probem-solving skill through define problems

Note that an aspect in focal awareness appears in more than one individual way of understanding. This is an important characteristic of the phenomenographic analysis wherein the analysis and interpretation of the transcripts are not done individually. Instead, "they collectively constitute the overall data where meanings are interpreted in relation with the others" (Sin, 2010 cites Creswell & Miller, 2000).

In the following discussion transcription excerpts and quotations were included to have a thick description to back up, "support and clarify the meanings of the reported conceptions" (Sin, 2010).

(1) *PLA is a cyclic procedure outlined in the curriculum done by teachers to measure students' understanding in Physics.* This embodied the personal conception of Teacher A. Teacher A was the youngest among all teacher-participants, a licensed professional teacher and is on his second year of teaching in a private-sectarian senior high school. It was noted by the researcher that during the interview, there were some instances that he needed longer time to reflect and gather his thoughts about how he understands what Physics Learning is. This finding was consistent with the Orgovanyi-Gajdos' study (2015) which contrasted a novice and expert teacher in terms of their abilities to articulate their perspectives. "The perception of experienced teachers is more analytical and interpretive than beginners" and the former "are able to select between the information and pick up the important ones (Orgovanyi-Gajdos, 2015).

According to Teacher A first step in the cycle correspnded to the term "Physics", the second was for the "Learning" while the third step covered the term "Assessment". To emphasize and clarify his point, Teacher A showed a diaram of PLA showing the words physics, learning and assessment that were arranged in a cycle with arrows from one word to the other. The steps in the procedure included the following: (i) teacher identifies the content standards from the government-given curriculum guide; (ii) teacher makes the lesson plan for the strategies; and (iii) teacher gives asessments to measure students' understandning of the content.

Excerpt from the interview transcript and the English translation of the Visayan and Filipino utterances (given in italics) are below to support the earlier claims.

> Interviewer: *Unsa karon ang kanang imohang pagsabot sa Physics learning assessment Sir?* (What is your personal understanding of Physics learning assessment Sir?)
> Teacher A: (pause). It's a process ma'am, I think... *kay procedural siya in a way kasi you follow step by step procedures.* (It's a process Ma'am, I think... because it's

procedural in a way because you follow step by step procedures.) You're given with the content standards, and then you, after you reflect on it, you try to make a lesson for that one. And then in the lesson, your assessment in there must be embedded.
Interviewer: Hmmm...
Teacher A: And then, when you give another assessment which is summative, you are actually hitting two birds in one stone, *yung sa, sa*... lecture and the theory... (...you are actually hitting two birds in one stone, the lecture and the theory...) at saka yung sa content standards. (...and the content standards.) So meaning, it's a process because it follows the step or a procedure. — Yes ma'am. Content standards...we have to refer to the... the curriculum guide of the Department of Education, ma'am and from there you make... a lesson plan...and then with that lesson plan, you have to identify the strategies where... the strategies that you would want to apply in class. Then later on, assessment will now come in wherein you gauge or measure if the students have understood the content that you have, ma'am. (*Interview with Teacher A, pp.13-14).
***

When asked where exactly in his cyclic process PLA came in, Teacher A explained that the three steps comprised the entire Physics Learning Assessment as he understood it. This was Teacher A's personal understanding of the interrelatedness between teaching strategies, pedagogies and assessment. In the latter part of the conversation, he discussed the cyclic process of PLA. Teacher A relied heavily on the curriculum guide from the government as he shared his understanding of what PLA is.

The emerging aspects in focal awareness of this way of understanding the meaning of PLA were the following: (1) the structure of assessment in relation to adhering to existing government policies; and (2) the teacher-centered view of PLA. The first aspect was evident when teacher based his personally-understood structure of what PLA is on a government document. He used the curriculum guide as the reference in describing the steps of PLA. The second aspect was inferred from his description of the steps he followed in coming up with PLA. Not much attention was given on the role of other players, if there were any. Hence, this showed that this way of understanding the meaning of PLA was indeed focused on its teacher-centered aspect (Huba and Freed, 2000).

(2) *PLA are the performance tasks which address the purpose of an educational reform.* This was how Teacher B expressed his way of understanding of what PLA is. Teacher B was a regular, full-time teacher in a public senior high school and has been teaching between six to ten years. Aside from being a licensed professional teacher, he was also an Electronics and Communications Engineer. Interview excerpt is given below.

> Teacher B: Aah... Physics Learning Assessment is the... is.. if there is a transfer of knowledge from the teacher to the students, that is already an assessment.
> Interviewer: *Pwede pa-elaborate, sir?* What do you mean? *Kanus-a nimo masulti nga* there's a transfer of knowledge, sir? (May you elaborate Sir? What do you mean? When can you say that there is transfer of knowledge?)
> Teacher B: Aaah, there's a transfer of knowledge if the student itself, aah, he can describe, he can identify, he can aah... he can apply the concept into a real-life situations.. and then they need to aah... based on their learning, aaah.. they're going to make a project out of it... so performance task.
> Interviewer: So basically Sir, when you speak of Physics Learning Assessment, are you saying *na equivalent sya para sa imo to performance task?(*...are you saying that it is equivalent to performance task?)
> Teacher B: Yes. Aah... because that is the... that is the purpose of Senior High School—aah, aah, K to 12 curriculum... aah, we'll not concentrate on aah... aah... more on written works.. but more on outputs. (*Interview with Teacher B, p. 9.)
> ***

In this way of understanding, the aspects in focal awareness evident in Teacher B's description of his personal meaning and structure of PLA based on the way he understood the purpose of the country's current educational reform were: (1) the structure of assessment in relation to adhering to existing policies; and (2) summative aspect of PLA. He equated assessment to the 'transfer of knowledge' from teacher to students, based on an existing government memorandum on classroom assessment in basic education (DepEd Order Number 8, series of 2015). He explained that the summative components of PLA cited in the memorandum were the written works, quarterly assessments and performance tasks. These summative components are the sources of grading the students. Teacher B put a much emphasis on the last component, performance task, where students are to show what they know and how they are able to do with what they know (DepEd Order

Number8, series of 2015). This was as constantly echoed in his utterances. This finding which showed how a teacher's understanding of assessment is influenced by his or her perceived way of adhering to a certain policy is somewhat reflective of the study of Aydeniz (2007). Aydeniz (2007) emphasized that political and structural components like administration policies and mandates, standards, curriculum and accountability measures compose the "factors that present challenges to the implementation of assessment reform in science classrooms".

Finally, Teacher B shared that a student who got a high grade and could explain a physics concept in his or her own words indicated that the student had learned Physics. The emphasis on grade as indicator of Physics learning was reflected in Teacher B's understanding of PLA as mainly being composed of summative components.

When asked what they understand to be indicators of Physics learning, three out of the four teachers expressed that a student's scores and grades were direct indicators. These teachers were A, B and C who all had formal education training as their undergraduate degree and were all professional licensed teachers. Only Teacher D (the only one who finished Applied Physics in tertiary education and a non-licensed teacher) did not explicitly express the direct relationship between students' scores and physics understanding. Teachers A, B and C shared that a high grade or score meant that a student gained Physics learning in a certain lesson that was covered by an assessment. Thus, the aspect in focal awareness was the summative aspect of PLA. This finding which showed the teachers' emphasis on students' test scores as indicator of Physics learning reflected what Abel and Volkmann (2006) and Brickhouse (2006) referred to as a problematic approach to any education reform. They argued that centering on aiming for high test scores of students limits the role of assessment to the accountability purposes. Consequently, this results in a kind of science teaching that is aimed at the "students' acquisition of only the knowledge and skills necessary for passing the test" (Aydeniz, 2007).

(3) *PLA tests how much a student understands in Physics and is best done through laboratory experiments*. The emerging aspect in focal awareness for this account was the emphasis on the application of learned concepts in real-life as the meaning PLA. Teacher D whose understanding of PLA was centered on this aspect was on his first year of teaching in a private senior high school. He had been a senior research specialist in physics before going into the academe. Consistent with his background, Teacher D gave much emphasis on independent work in a laboratory in order to determine how much students have learned. However, it was noted that for Teacher D PLA consisted of written tests like quizzes and seatworks dealing with defined and structured problems.

In the course of Teacher D's sharing, the aspect in focal awareness which emphasized application of learned concepts in real life, became more evident as shown in the following excerpt from his interview.

> Teacher D: What's more important *sa akin is 'yong, as I said, is like yong experiments sa laboratory kasi that's the best na ano field kasi di lang sya solving.. Ma-feel nimo sya tanan, ma-relate nimo ang concepts,* and you try to solve that certain experiment from what you understood.. so it's not just ano, as I said you must be able to articulate the concept well and apply it in real life. (What's more important for me, as I said, are the laboratory experiments because that's the best field because it is not just on solving. It is where you feel everything, you can relate the concepts and you try to solve that certain experiment from what you understood, so it's just.. as I said, you must be able to articulate the concept well and apply it in real life.) (*Interview with Teacher D, p.8.)
> ***

Aside from Teacher D, Teacher B also shared the same focus as he emphasized the goal of giving performance tasks as the highlight of what PLA is. Both teachers had undergraduate degrees that were aligned with apllied science. Teacher B finished Electronics and Communication Engineering in addition to this education degree, while Teacher D took up Applied Physics. On the other hand, Teachers A and C who did not express this way of understanding both had education degree in their tertiary level. For Teacher B, PLA is giving performance tasks that give students opportunities to apply what they have learned in real-life but with more emphasis on creating or producing outputs, in contrast to Teacher D who stressed laboratory experiments for the application part. This finding resonated with the argument of Reese (2011) regarding the principle behind "learning by doing", in that both teachers emphasized that learning becomes more meaningful when the students are engaged in hands-on activities like working and investigating through laboratory activities.

(4) *PLA is designed to measure how much is learned or not learned in Physics with respect to a government-given curriculum guide.* This way of understanding PLA was shared by Teacher C, a full-time, regular teacher in a public senior high school for six to ten years. He is currently pursuing Doctor of Philosophy in Physics Education. In teacher C's context, the first emerging aspect in focal awareness was similar to Teachers A and B which was the structure of assessment in relation to adhering to existing policies. However, unlike Teacher A who focused on the steps of his self-made process of PLA and Teacher B who centered on giving performance tasks as being required by an existing document on classroom assessment, Teacher C focused on the designing limitations of PLA as an assessment instrument. It was the curriculum guide that was ultimately considered in designing PLA. In other words, it was noted that teacher C emphasized the alignment of PLA with the objectives of instruction as reflected in the given curriculum guide.

> Teacher C: Ahh, Physics Learning Assessment? It should be an assessment uhhh.. designed so that.. uhh specific learning competencies, as well as the performance standards stipulated in the DepEd.. because we are working within the bounds of that

curriculum guide. The assessment for Physics should be designed to... to measure how much is learned or how much is not learned. (*Interview with Teacher C, p.16)
***

Furthermore, Teacher C emphasized that planning and designing his actual instruction primarily depended on the kind of assessment he intended to give. Teacher C claimed to be a believer of the 'backward design' by Wiggins and McTighe (1998) wherein specific learning outcomes precede the kind of instructional approach to employ. In Teacher C's case, performance tasks were deemed as the intended assessment that guided his instructional planning and designing. Teacher C added that the activities of his students in their daily class prepared them for their performance tasks. Below is a quote of teacher C as he emphasized the relationship between his instruction or actual lesson and the design of his PLA.

> Teacher C: Ahh, I always think of the assessment and the nature of the assessment and then what kind of task they will be doing, so my lesson should be designed in such a way that will prepare them to do the task later. --- It's more of the lesson itself is *parang* rehearsal for the performance task. (It's more of the lesson itself is like a rehearsal for the performance task.)
> (*Interview with Teacher C, p. 14)
> ***

Teacher C shared that most of the time, his personal understanding of what PLA should be did not really happen in actuality. There were times that he tended to go back to the traditional way of teaching and assessment because of limited time and resources. Class suspensions due to meetings and holidays caused delays in their lessons. In order to cope with the lost sessions and to cover all of the learning competencies that he understood to be required by the curriculum guide, Teacher C went back to the usual pencil-and-paper PLA. In this kind of PLA, students were tasked to solve defined and structured word problems from a college-level electronic reference book. The said type of reference was being used in Teacher C's class because they did not have a prescribed textbook for General Physics I. The electronic reference is downloadble from the internet free of charge. Another aspect in focal awareness evident in Teacher C's sharing was the assessment of analytical problem-solving skill through defined and structured problems.

> Teacher C: However, there are some instances that i tend to go back to traditional way of teaching, because of... ahh in reality here... there are some instances that classes are eventually – uhh.. I don't... it's not eventually *but bigla nalangganito, ganyan. So,mag i-wan ka nalang ng seat work.* — And yahh, it's quite frustrating *kasi ang mangyayari parang pencil-paper nalang din lage 'yung ano.. — yun bang uhh... it's more of yung analytical naturelang lage but 'yung investigative and other scientific skills parang nasa-sacrifice minsan because of the available resources, both time and material resources.*
> (However, there are some instances that I tend to go back to traditional way of teaching, because of .. ahh in reality here... there are some instances that classes are eventually – uhh.. I don't... it's not eventually but with very short notice, things change. So you will just leave a seatwork. –And yeah, it's quite frustrating because what happens is that you resort again to pencil and paper... and it's like... it's usually more of the analytical nature but the investigative and other scientific skills are sometimes sacrificed because of the available resources, both time and material resources.) (*Interview with Teacher C, p.15)

This finding corresponded to the study of Kauffman et al (2002) which argued that during an implementation of an educational reform, teachers, specially the new ones, tended to slide back to the old and usual traditional practices due to lack of structural and political support. As a result, teachers exhausted every known possible means just to get through a day in class as he or she struggled to adhere to a certain required educational reform. This oftenly led them to the verge of using their own personal resources such as money and time. Kauffman et al (2002) suggested that an urgent need to reconsider the curricula and support be provided to new teachers in times of an educational reform implementation. In the context of the finding in this study, Teacher C shared that it was the extremely long learning competencies that they were required to cover that led him to go the opposite direction of the kind of PLA that he understood must be.

Teachers' Ways of Understanding PLA: *Purpose* Dimension

As regards the second dimension of understanding referred to in this study as the *purpose* dimension (*why* PLA is given), the teachers' identified emerging aspects in their focal awareness were given in Table 7.

Table 7 Teachers' Ways of Understanding PLA in the '*Purpose*' Dimension

Teachers' Ways of Understanding (*Purpose* dimension)	Teacher(s) Who Expressed the Given Understanding	Aspects in Focal Awareness
1.PLA is given to measure students' understanding, performance and skills in Physics.	Teachers A, B, C and D	*summative aspect of PLA *score as indicator of Phyics learning
2. PLA is given to prompt the students of their learning goals.	Teacher B (The only one with engineering background and administrative position as the STEM Coordinator.)	*PLA as a guide for students
3. PLA is given to measure the effectiveness of a teacher's teaching strategy.	Teachers B and D (The only two who both had undergraduate degrees aligned with applied science—engineering for Teacher B and applied physics for Teacher D)	*relationship between instruction and assessment results *teacher's self-evaluation for continuous development * score as indicator of Phyics learning
4. PLA is given to prepare the students for college.	Teachers A and B (Both were licensed professional teachers.)	*impact of PLA in students' preparation for college
5. PLA is given in fulfillment of teacher's responsibility of giving assessments.	Teacher A (The youngest and still on his second year of teaching.)	*assessment as a teacher's fundamental responsibility

(1) *PLA is given to measure students' understanding, performance and skills in Physics*. This understanding of the purpose of PLA was expressed by all of the four teachers, in one way or another. The emerging aspects in focal awareness here were the following: the summative aspect of PLA; and score as indicator of Physics learning.

For Teacher A, he expressed that PLA is given to the students to determine whether or not the students have mastered the skills in Physics and somehow get their tuition's worth.

> Teacher A: *Parang ano ma'am, 'yang...* what's the purpose of Physics Learning Assessment? (pause). To determine if they have mastered the skills for that particular class, for Physics. *Para mahibaw-an niya kung naa ba sila'y na-master na skills sa pag-adto nila sa school...para dili... dili pud masayang ang ilang kwarta. In that particular... para practical pud sya*".
> (It's something like this Ma'am... what's the purpose of Physics learning assessment? To determine if they (the students) have mastered the skills for that particular class, for Physics. So that the teacher can determine whether the students have mastered some skills as they attend school... so that... money will not be wasted (referring to the tuition that students pay to the school). So that it would also be practical.) (*interview with Teacher A, p. 36)

Moreover, Teacher B shared that by looking at the scores of the students in a certain PLA that was given, one would be able to measure students' performance in Physics. A high score was again emphasized to indicate that Physics learning has been achieved. Should three-fourths or seventy-five percent of the class fail a given PLA, Teacher B shared that it was an indication of a poor Physics performance which called for him to reteach the topic that was covered in the said PLA. He believed that by re-teaching, it was expected that the students would learn the lesson well. Hence, the purpose of PLA here was understood to measure students' "status on whether they understand the lesson or not" (*interview with teacher B, p. 23). This finding was another point that reiterated the emphasis of Aydeniz (2007) on the influence of how a teacher looked and valued students' test scores to the kind of science teaching that could take place in a classroom.

Teacher C emphasized that it was only through giving PLA that the teacher and the students knew what still needed to be developed in the latter. He added that the purpose of giving PLA was to determine whether or not the students attained the objectives. There was a stress made by Teacher C that the objective was not the delivery of content by the teacher but for the students to perform particular competencies. Quoting the statement of Teacher C on this point:

> Teacher C: That's the only way we would know if we have attained yet the objectives or not, because the objective is not to deliver the content. The objective is for the student to able to perform particular competencies or to perform...uhh...or to possess particular set of knowledge or conception or conceptualizations of Physics or sa Physics concepts noh. Uhh... Assessment is the only way I know. It's the only way that we could verify if they have attained the objectives. (*Interview with Teacher C, p. 19).
> ***

Moreover, Teacher C shared that the results of PLA served as basis for the teacher in deciding whether to move forward to the teaching of the other competencies or to re-teach the present.

Teacher D focused on looking at the essence of giving PLA as a tool that could be used by students to evaluate themselves and determine areas of a lesson which they needed to study and understand more. What was common among the understanding of the four teachers in this aspect was that the purpose was to determine where the students were in terms of their understanding, knowledge and skills in Physics. The teachers repeatedly expressed that by reflecting on the scores and grades of the students in PLA, both the teachers and students could determine the status of the students in their Physics learning. The understanding that test scores in PLA was the sole and direct measure of students' Physics learning somehow contradicted the assessment principles that is centered on "ensuring that the overall accountability system is fair and meaningful" (NEA, 2011). It was rallied that test should "account for the fact that many factors influence a student's performance beyond the classroom and the school" and that "one or two test results should never be the sole indicators of student growth and achievement" (NEA, 2011).

Moreover, the way of understanding that was revealed here corresponded to the 'teaching paradigm group' of Schwager (1994) which described an assessment paradigm of teachers that "tends to focus on assessing student proficiency or mastery of specified curriculum".

(2) *PLA is given to prompt the students of their learning goals*. The emerging aspect in focal awareness here was taking PLA as a guide for the students. Teacher B emphasized that the objectives of a lesson were essentially also the objectives of an assessment. Thus, these objectives must be given to the students before conducting any assessment. With this, the students were prompted on what learning goals to set in relation to the objectives of an assessment. Before giving a particular task like a performance task for instance, it was stressed that students must be given rubrics wherein standards to be followed were given as students' guide. Excerpt of the interview with Teacher B on the purpose of PLA is given below.

> Teacher B: Aah, of course, we need that one, ok, *unang-una* ("first of all"), in order for, aah... in order to... to make learners be aware of their learning goals. To make learner be aware of their learning goals, aah... if we have a... if we have an assessment, of course, aah, before we are going to start a—before we'll going to conduct an assessment, of course we are going to see the objectives of the lesson or the objective of our assessment, and of course, also, it will make the learners be aware of their learning goal. (*Interview with Teacher B, p. 23)
> ***

Teacher B who gave this way of understanding the purpose of PLA was the only one among the four teachers who had engineering background in addition to his education degree. He was also the sole teacher-informant who was handling an administrative post in their school as the STEM Coordinator during the conduct of this study.

Teacher B's understanding on the purpose of PLA which was to prompt the students of what learning goals to set was in consonance with the study of Craw (2009). Craw (2009) claimed that assessment criteria that were shared to the students in advance provided students with a clear understanding of their learning targets. This led to the improvement of students' understanding. In addition to this, this also supported several scholars who emphasized that the purpose of giving assessment was to support student learning (Black & William, 1998; Brookhart, 2006; Klassen, 2006; Shepard, 2000).

(3) *PLA is given to measure the effectiveness of a teacher's teaching strategy.* This finding corresponded to the view of Bell and Cowie (2001) that the purpose of assessment is to evaluate the quality and effectiveness of instruction. Three emerging and overlapping aspects in focal awareness which were also present in the other ways of understanding were: (1) the relationship between instruction and assessment results; (2) teacher's self-evaluation for continuous development; and (3) students' score as indicator of Physics learning. It was difficult to discuss each of these separately because they tended to overlap with one another.

Teachers B and D expressed this way of understanding PLA purpose. Both were the only ones in the study who had undergraduate degrees that were aligned with applied science (engineering for Teacher B, aside from this education degree, and applied physics for Teacher D). On the other hand, both teachers A and C, solely had education degrees.

Teacher B stressed that the areas of a lesson with common mistakes indicated teacher's shortcoming. This was a signal to the teacher that he or she needed to device another strategy that would address the students' identified weaknesses. Quotes from Teachers B and D were given below in support to this analysis.

> Teacher B: So if your test is difficult, aah, or if the students, aah, most of the students failed in that assessment... when we say most, aah... for example, 70% failed...so, that is a feedback *na* (that) you need to enhance, you need to develop a strategy to improve the... to improve the learning of the students". (*Interview with Teacher B, p. 23).
>
> ***
>
> Teacher D: *Sa teacher most probably ano sya test sad.* For example *sa mga learners, makita nimo nga naa silay common nga mistakes so most probably may fault pud ang teacher ana. Most probably dili kaayo klaro iyang pagteach or wala sya nagteach in the first place, so assessment pud na sa mga teachers nga where could I help them once you identified ang common nila ma'am, ang common na mistakes.*

(For the teacher, most probably it is also a test. For example the learners, you identify that they have common mistakes so most probably the teacher is also at fault. Most probably, you did not teach it very clearly or you did not teach it at all in the first place, so it's also an assessment for the teachers to think on where could I help them once you identified their common mistakes Ma'am.) (*Interview with Teacher D, p. 12)
***

This finding was similar to the findings of Brown et al (2009). In their study, Hong Kong primary .and secondary teachers were found to use diagnostic and improvement assessment practices. These included analyzing student strengths and weaknesses, giving feedback and modifying teaching plans (Brown et al, 2009). Brown et al (2009) added that these practices showed that the teachers' purpose of assessment was student improvement. Similarly in this study, there was also an understanding that the purpose of PLA was for the improvement of instruction aimed ultimately at students' improvement in Physics.

(4) *PLA is given to prepare the students for college*. The emerging aspect in focal awareness here was the impact of PLA in students' preparation for college. In this way of understanding, the purpose of giving PLA through problem-solving was to give the students a foretaste of the kind of training that they would be encountering should they proceed to any STEM-related programs in higher education. Two of the four teachers (Teachers A and B) shared this kind of understanding of PLA purpose. A common profile characteristic to both teachers were their licenses as professional teachers which Teacher D did not have. And unlike Teacher C, Teachers A and B were not taking any post-graduate degree.

Teacher A emphasized that he gives PLA to help the learners encounter less difficulty in college with the premise that PLA was like a practice for college.

Teacher B shared the same understanding as he expounded about the performance task that he gave to his students. He requiredeach student to solve at least two hundred fifty (250) to five hundred (500) word problems to be written manually on a record book. This would be submitted at the end of a quarter. Teacher B cited that being an engineering student before, he knew very well how to succeed in the college training. Requiring students to solve in their record books at least three word problems everyday was a way of extending their immersion in Physics even beyond their daily class. The development of the values of patience and self-motivation as another aspect of preparing for college was also embedded in this purpose of giving PLA. On the more practical side, Teacher B shared that the reason of requiring the students to write their solutions on a record book instead of ordinary notebooks was mainly because of the durability of the former than of the latter. It was noted in this kind of purpose of giving PLA how the perceived future college education of the students and the teacher's educational background impacted the purpose of the PLA practices of the teacher. Interview excerpts of Teacher B were given below to support this finding.

> Teacher B: That is my personal experience because aah, in my background as an engineering student before ..aah, I learn many things in that kind of assessment because aah, your time in school, in 24 hours a day, you have only one hour in Physics and the rest of that is your time in your, in your home solving problem. That is why I always give them problem sets, and then at the end of the quarter, I... *yung sabi ko kanina, meron na silang mga conceptual map. O... kasi,* that conceptual map will somehow summarize the concept they learn in the particular topic.(...as what I've mentioned earlier, they have their conceptual map. Yes... because, that conceptual map will somehow summarize the concept they learn in the particular topic..)(*Interview with Teacher B, p. 15).
>
> ***
>
> Teacher B: The effect of writing is retention and of course to somehow improve your motor skills...and, in every stroke of your hand, there's always a learning, even by flipping the book. That is why, and of course the patience. *Yan yung problema sa mga, sa generation ngayon, wala nang patience and ayaw nang magsulat. And then hindi nila alam* why in writing, they can learn many things.
> (The effect of writing is retention and of course to somehow improve your motor skills...and, in every stroke of your hand, there's always a learning, even by flipping the book. That is why, and of course the patience. That is the problem in toayd's generation, there is no patience and they do not want to write anymore. And then, they do not know why they can learn many things in writing.) (*Interview with teacher B, p. 16)

(5) *PLA is given in fulfillment of teacher's responsibility of giving assessments.* The emerging aspect in focal awareness here was taking assessment-giving as a fundamental responsibility of a teacher. Only Teacher A shared this purpose of PLA.

Based on his profile background, Teacher A was a fresh education graduate, the youngest among the four teachers in the study. He was still a novice teacher as he just passed the licensure examination for teachers and still on his second year of teaching during the conduct of his study. This finding showed how a teacher's way of understanding was being influenced by his awareness of a certain culture of how things were being done around him. This was seen in the utterance of Teacher A when asked about what he thought was the purpose of giving PLA:

> Teacher A: *Mao man ang naandan. Mao man jud sya ang* requirement to become a teacher."
> (Things have always been that way. That is really the requirement to become a teacher.) (*Interview with teacher A, p. 32.)
> ***

In addition to this, Teacher A perceived that the purpose of giving PLA to his students was simply dictated by his culture of fulfilling a fundamental requirement and responsibility of a teacher. As a teacher, he was left with no choice simply because it was called for by his profession. Excerpt of the interview with Teacher A was given below to support this finding.

> Teacher A: *Ano, responsibility man sa teacher, 'di ba to give assessment because teacher man siya. Naga-teach sya...*but how do you teach? You use assessments and strategies.
> (It is a responsibility of a teacher to give assessment because he/she is a teacher, isn't ? He/She teaches... but how do you teach? You use assessments and strategies.)
> (*Interview with Teacher A, p.32)
> ***

This finding which illustrated cultural patterns as an influence on teachers' conceptions of assessment corresponded with Singer's (1968) description of cultural patterns as being "crystallized in social structure as institutionalized and standardized modes of behavior and thought whose normal forms are socially recognized in the explicit or implicit rules to which the members of a society tend to conform". This was reflected in how Teacher A talked about giving PLA simply because that was how he has known things should be for a teacher.

Finally, this finding also resonated with some recent studies which indicated the impact of cultural and political structures on teachers' conceptions and assessment practices (Aydeniz, 2007 citing Berliner, 2006; Darling-Hammond, 2003; and Stiggins, 2004).

Teachers' Ways of Understanding PLA: *Process* Dimension

The analysis of the teachers' ways of understanding the process of PLA (how PLA is done) is given in Table 8.

Table 8 Teachers' Ways of Understanding PLA in the *Process* Dimension

Teachers' Ways of Understanding (*process* dimension)	Teacher(s) Who Expressed the Given Understanding	Aspects in Focal Awareness
1.PLA starts in using students' experience in a teacher's lecture, proceeds to giving of written works and practical applications.	Teacher D and B (The only two who both had undergraduate degrees aligned with applied science -- engineering for Teacher B and applied physics for Teacher D)	*Analytical problem-solving skill development *Practical aspect of PLA
2.PLA is a cyclic process with the following steps: (i) identifying the objectives of the lesson; (ii) using teaching strategies; and (iii) giving of assessments.	Teacher A (The youngest and still on his second year of teaching.)	*Inseparability of instruction and assessment *Adhering to existing policy
3.PLA may include career guidance for students' self-assessment.	Teacher B (The only one with engineering background and administrative position as the STEM Coordinator.)	*Informal PLA
4.PLA must include students' tasks with outputs that can still be used in college.	Teachers A and B (Both were licensed professional teachers.)	*Students' preparation for college
5.PLA must include assessment of students' level of engagement.	Teachers A and C (The only two teachers who had education degree as their sole undergraduate formal training. Both were licensed professional teachers.)	*Informal PLA

(1) PLA starts in using students' experiences in teacher's lecture, proceeds to giving of written works and practical applications. The emerging aspects in focal

awareness here were the analytical problem-solving skill development among the students and the practical aspect of PLA.

Teachers D and B showed this way of understanding PLA process. Only Teachers D and B had undergraduate degrees which were along the category of applied science. Teacher D was an Applied Physics graduate while Teacher B also finished a degree in Electronics and Communication Engineering aside from his education degree. In Teacher D's utterances, he emphasized the utilization of the students' real-world experiences as a springboard or basis of his lecture. He enumerated two levels of doing PLA with the second one viewed at a higher level than the first. The first level is the giving of word problems in the form of seatworks, quizzes and homework. He centered his attention on the first level of his PLA process as mainly through written tasks and solving of defined and structured word problems.

The second level of Teacher D's PLA process was giving of open-ended laboratory activities. Much focus was centered on allowing the students to experience a laboratory experiment as one way of emphasizing the practical applications of Physics concepts learned in the lecture class. Moreover, he looked at this level as an opportunity for students to work with peers, discuss, debate and come up with answers as scientists do in the real world. Excerpts of the researcher's interview with Teacher D were given below to support these findings.

> Teacher D: So in general maam, for example after you do the... *kung pwede gani maam ano sya kanang SLE... kanang structured learning experience, kanang una dapat maka-experience.* (So in general ma'am, for example after you do the... if possible you give SLS.. it's structured learning experience. The experience must be the first.)
> Interviewer: *Unsa na sya sir?* Enlighten me please. *Unsay konsepto anang SLE sir?* (What is that Sir? Enlighten me please. What's the concept behind SLE Sir?)
> Teacher D: That they experience it first then from that experience *didto ka papasok ang concept.* Like *kanang sa physics makita nato* evidently everywhere *sa atong* daily life. Once *ma-experience na nila* what we can do sa lecture we can simplify ang lecture, *irelate nato sya sa daily na mga makita nato.* (That they experience it first then concept comes in from that experience. Like in Physics, we see it evidently

everywhere in our daily life. Once they have experienced it, we can simplify it in the lecture, we relate it in the things we see in daily life.)

Interviewer:So you're saying to make it relatable for the students? *Tama ba akong pagsabot Sir?* (Is my understanding right, Sir?)

Teacher D: *Opo.* From that lecture *maka-help sila*, and of course we have to check if ok *ba siya,* do they understand it? Then *maghatag ka ug* either seatwork, assignment and *mga quizzes ing ana sya. pero para sa ako* that's just a first level. Second level is *yong* laboratory. I think very important *na* they could ah apply it in real life what they have learned, *dili lang ky magsolve-solve lang ug problem.* It is also a big help for me *ang laboratory kay* they get the experience, *na-feel or ma-touch nila* whatever they learn, like philosophy, *makita jud nila na,"ah ganito pala yong philosophy* in real life".The beauty of it they have groupmate. They could discuss for example if *di pa masyadong naintindihan* specific topic, those who understood, they could ask that person.

(Yes. These can help in the lecture, and ofcourse we have to check if it's okay, do they understand it? Then you give either seatwork, assignment and quizzes, things like that, but for me that's just the first level. Second level is the laboratory. I think very important na they could ah apply it in real life what they have learned, instead of mere problem-solving. It is also a big help for me, the laboratory because they get the experience, they can feel or touvh whatever they learn, like philosophy, they would really see and say, "so this is what philosophy is in real life". The beauty of it they have groupmate. They could discuss for example, if they have not understood a specific topic, those who understood, they could ask that person.(*Interview with Teacher D, p. 14)

***

However, Teacher D shared that what he understood as the way of doing the second level of PLA was not what really happened in his laboratory class. His students were given "recipe-like" laboratory sheets which had the steps on how to conduct a certain activity. This practice, though saved them time, took the fun out of doing laboratory experiments. Below is a quote of Teacher D's statement when asked about the performance of his students in the laboratory activity that they did.

Teacher D: *Dili kayo ma'am* when it comes to the analysis but it's ok *kay first paman to sya. Pero* I think that's one of the drawback *pud kasi* I emphasize *na ganahan ko sa* experiment *pero* we know *na meron pang mga close ug open -ended na mga* experiment. Ok for example *sa atong lab man gud medyo ano, naa tay pop sheet then we do the thing na, recipe sya.. medyo ok sya, dali sya humanon pero* for me you're taking the fun out of it.— Ah *ok man siguro kung open-ended sya na* style just like... give them the tools and help them develop the experiment.

(Not much when it comes to the analysis but it's okay because that's still the first time. But I think that's one of the drawback, too because I emphasize that I prefer experiment but we know that we have close and open-ended experiment. Okay, for example in our lab we give pop sheet and then do the thing, like a recipe. It's a bit good because it's quick to accomplish but for me you're taking the fun out if it. Ah it's okay, perhaps, if it'sopen-ended style just like... give them the tools and help them develop the experiment.)(*Interview with teacher D, p. 15-16)

Teacher B shared the same conception as Teacher D in that PLA was composed of written works, quarterly assessment and performance task. He further emphasized that the most important among the three forms was the performance task because it required students to have an output or a product. This output ideally centers on the practical applications of the concepts learned in Physics into real-life situations.

Teacher B agreed with Teacher D with respect to the issue of what must be done versus what could actually be done. To Teacher B the number of the learning competencies in the curriculum guide that must be taught was just too much that, there was tension between what he wished to do as a process for PLA and what he did. Instead of giving performance tasks that led to creation of outputs with real-life practical applications, the outputs were mainly focused on the students' ability to solve defined and structured word problems. In the end, the performance task appeared like a usual problem-solving quiz or seatwork but only with longer coverage. Excerpts of the interview with Teacher B was given below in support to this finding.

> Teacher B: *Aaah, napakadaming* competencies in a quarter...so in the first quarter, we have a hundred of learning competencies. --- Aaah... right now, most of our discussions, *yung sinasabi ko na* performance task that is the very ideal but, in the... in real setting as of this time, aah, *mahirap i-perform*. It is because *sa daming* learning competencies, so what we did most of the time is more on lecture method which is *hindi dapat*, but we have also the obligation, as much as possible, to discuss all the learning competencies." (Aahh.. there are so many competencies in a quarter... so in the first quarter, we have a hundred of learning competencies. --- Aaah...right now, most of our discussions, the performance tasks that I mentioned before is very ideal but, in the... in real setting as of this time, aah, it's difficult to perform. It is because of the number of learning competencies, so what we did most of the time is more on lecture method which should not be, but we have also the obligation, as much as possible, to discuss all the learning competencies.)(*Interview with Teacher B, p. 14)
> ***

This concern of the teachers regarding learning competencies was validated by the researcher's document analysis of the General Physics 1 curriculum guide (http://www.deped.gov.ph). Analysis of the curriculum guide showed that there was a total of one hundred, thirty-five learning competencies which the teachers believed must all be taught or at least covered and introduced to the students within the total eighty (80) contact hours in a semester. Some of these learning competencies were the level of the high-order thinking processes such as analyzing, evaluating and creating based on the Revised Bloom's taxonomy of thinking skills (Anderson and Krathwohl, 2001). Moreover, these were to be taught and learned through the methods and concepts of algebra, geometry, trigonometry, graphical analysis, and basic calculus (http://www.deped.gov.ph). This implied that developing these kinds of competencies among the students indeed demanded time as expressed by the teachers for this subject.

(2) *PLA is a cyclic process with the following steps: (i)identifying the objectives of the lesson, (ii) using teaching strategies, and (iii) giving of assessments*. Only Teacher A expressed this way of understanding the process of PLA. Compared to the other three teachers, Teacher A had a relatively least experience in teaching and other physics-related endeavours such as research and industry practice. He was the youngest whose sole undergraduate training was his education degree. He just received his teacher's license several months before the conduct of this study.

This expressed view of Teacher A on the process of PLA was a reiteration of the meaning that he gave to PLA as discussed in the earlier part of Table 6. Moreover, the emerging aspect in focal awareness here appeared to be the perceived inseparability of instruction and assessment. As consistently shown in the utterances of Teacher A, PLA was perceived to be involving the planning and implementing stages of instruction. The first step in the PLA process that teacher A described corresponded to the designing of a lesson plan where the teacher took note of the objectives of a lesson while the second step talked about the actual teaching where the chosen strategies were to be used. Although it was only in the third and last step where assessment was done, Teacher A emphasized that the first two were parts of the whole PLA process. Hence, Teacher A implied that instruction and assessment were inseparable. Given below is an excerpt of Teacher A's statement that supports the finding presented.

> Teacher A: Physics Learning assessment is done by following certain steps. First *kay* (is), identify the content standards, and performance standards given or learning competences given by the Department of Education, so you start from there, and then you make learning plans out of those, aah, competences and given those learning plans, you must identify what strategies to use to help the student's learn, or what assessment to use... so in that case ma'am, if for example...ahhh.. and that is instruction na part for the learning plan. And then later on, how do you assess if the students had learned the lesson, you use your assessment tools, whether formative or summative assessments. So that is... first step is, identifying the objectives, and then you make learning plans, activities and... umm... strategies that are employed in class, and then you have your assessment. So cyclical *sya na* process. (... So it's a cyclical process.)
> (*Interview with Teacher A, pp.32-33)
> ***

(3) *PLA includes career guidance for students' self-assessment.* Teacher B expressed this way of understanding PLA process. The profile characteristics unique to Teacher B were his engineering background and administrative position as their school's STEM Coordinator. The emerging aspect in focal awareness here was the informal aspect of PLA. Informal assessments were classified as less formal in approach because these do not include "standardized methods in measuring and interpreting the student's performance and learning" (Lee, 2013). Moreover, Lee (2013) added that the focus of the teacher as he or she implements this type of assessment is the students' actual performance.

In the context of Teacher B's sharing, the informal aspect of PLA was seen in his practice of giving informal career guidance to the students before they even proceed to taking General Physics in Grade 12. He explained that during enrollment in their Grade 11, he interviewed all would-be STEM strand students noting primarily on their previous science grades. The interview focused on asking the students some reflective questions about their study habits and degree of self-motivation. The teacher emphasized that as early as this time, the students need to be reminded of assessing themselves first whether or not they have the values of diligence and self-motivation that are deemed important in order to succeed in the chosen academic strand.

Moreover, Teacher B emphasized that the interview was a form of career guidance because the students were in a way, being guided of what to expect should they enter the STEM-related disciplines in senior high school and towards college. Furthermore, Teacher B pointed out that he considered the informai interviews as early part of PLA. He shared that it was somewhat helpful because so far, his STEM students accomplished whatever tasks were given to them. Teacher B added that although students grumbled in the beginning, especially when doing lengthy problem-solving, they still delivered in the end. On the other hand, Teacher B clarified that there were no official guidelines yet on how the said practice be done institutionally. Excerpts of Teacher B's statements when asked about the performance of his students in their problem sets are given below in support of this finding.

> Teacher B: So far, aah, so far... of course in my subject, in my track, since they are in STEM track, *medyo hindi problema yung grade.* The STEM students *kasi* ahm... expected *kasi 'pag papasok ka—kasi mayroong ano, mayroong career guidance, ako yung nagka-conduct during enrollment. During enrollment, lahat nang gustong mag-STEM, papasok talaga sa—aah, lahat ng gustong mag-STEM, dadaan muna nang interview sa akin,* Grade 11."
> (So far, aah, so far... of course in my subject, in my track, since they are in STEM track, grade is not much of a problem. Because the STEM students ahm... it's expected if your enter – we have a career guidance which I conduct during enrollment. During enrollment, all of those who wish to enter STEM go through an interview with me in Grade 11.) (*Interview with Teacher B, p. 17)
> ***
> Teacher B: What I did is *'yung* for example, *yung may mga* grade na 75, 70 *sa Science na gusto mag-STEM* I discourage them to enroll in, I discourage them to enroll in STEM because, aah, there's a big possibility that aah...aah... *parang mahirapan sila.*
> (What I did is, for example, those who have Science grade of 75, 70 and wish to enter into STEM, I discourage them from enrolling in STEM because, aahh, ther's a big possibility that aah.. aah.. they'll have difficulties.")(*Interview with Teacher B, p. 18)
> ***
> Teacher B: From the very beginning *pa lang, aah, sa enrollment pa lang, alam nila anong mangyari sa STEM. So di na sila ma-shock.. kay if ever naay ma-shock, akong*

buybuyon. (laughs) "kabalo baya ka daan ha? Nag-istorya na ta."— Kaya sabi ko merong option. Kaya nga—ang technique ko dito ma'am, kasi for 2 years, aah, wala pang pro—wala pang guidelines from the DepEd .. so, more on career guidance. "Kung papasok ka sa STEM, itong mangyari sayo. Meron ka bang study habit? If wala, kailangan mo talagang merong study habit.

("From the very beginning, aah, during enrollment, they already know what will happen in STEM. So they won't be shocked, because if ever there will be, I will really remind them (laughs), " you already knew, right? We've talked." – So I sayd there's an option. That's why Ma'am, my technique for two years, aah.. but there are no guidelines yet from the DepEd... so more oncareer guidance. "This is what happens to you whe you go to STEM. Do you have a study habit? If none, then you really have to have study habit.) (*Interview with Teacher B, p. 45)

***

This finding reiterated Lee (2013) who argued that informal assessment was "more useful in the teaching-learning process because it determined the learning strengths and limitations of students." As shown in the utterances of Teacher B, he acknowledged the perceived positive outcome of his informal PLA as reflected in his students' ability to comply with the requirements as STEM students. He further believed that the early career guidance contributed to the general performance of his students amidst the limited resources that they had in their school.

(4) *PLA must include students' tasks with outputs that can still be used in college.* The emerging aspect in focal awareness here was the role of PLA in students' preparation for college. This implied the perceived future dimension of the process of PLA. In this way of understanding, a teacher's manner of implementing PLA was driven by the perceived impact on students' future training in tertiary education. Recalling earlier, two Teachers, A and B, expressed an emphasis on the future dimension of PLA as one of the foci of the purpose of giving PLA (see discussion of entry four of Table 7 earlier). Both teachers were licensed. As they explained their thoughts on their perceived components of PLA, their utterances also showed their understanding on the process of doing PLA. As presented earlier, Teacher A highlighted giving of PLA as a way of minimizing difficulties that could be encountered as students go to college. Moreover, Teacher B was also consistent in

his point on giving PLA to the students that would yield to products that could still be useful in their college. A durable record book where students manually write their solutions to at least two hundred fifty to five hundred word problems was deemed by Teacher B as part of such kind of PLA process.

(5) *PLA must include assessment of students' level of engagement.* Teachers C and A expressed this conception on the process of PLA. Both were licensed professional teachers and the only two who had education degree as their sole undergraduate degrees. Unlike Teachers B and D, Teachers A and C did not have any background in applied science or technology. Simiiar in a way to the focal awareness identified in the third entry of Table 7, this way of understanding the process of PLA by Teachers C and A also centered on the informal aspect or form of PLA that was perceived to be an important part of the process of giving PLA. Teacher C emphasized informal assessment here in a form of actual observation of students' behavior in class during an activity (Lee, 2013). Specifically, Teacher C talked about informally determining students' engagement through the teacher's sensitivity and responsiveness to the non-verbal languages of the students. Teacher C's utterances that support this finding is given below.

> Teacher C: Every time. Anytime. When I say every time, we always- as a teacher in Physics. We should always be very sensitive specially with even with the facial expressions of the students. That's already a feedback already when you give lectures or exercise. Their engagement to the task is one of... as a formative assessment though it's very informal.(*Interview with Teacher C, p. 20)
>
> ***

Teachers C and A agreed that student engagement was also displayed by the length of time that students deliberately extend for their interaction and consultation with their teacher. Teacher A, on the other hand, expressed that the provision of consultation time as another form of informal or formative PLA was not much being patronized or availed by his students. He noticed that it was very seldom that his students saw him during this time which was supposedly allotted for consultation. Teachers A and C are quoted below in relation to this finding.

> Teacher A: Umm, if possible, *'yung* consultation, more hours. ---Consultation *sa*, umm... if for example *may students na may* questions regarding the lesson, if they cannot ask it in... during the class and then they would want to, to approach me and then ask question there, I'll help them and teach the lesson.--- So far ma'am, *wala man gaduol.--- Pero* they already know, ma'am.---They don't ... *Dili sila naga-contact.* (Umm, if possible, more hours for consultation---Consultation in, umm... if for example ther are students who have questions regarding the lesson, if they cannot ask it in... during the class and then they would want to, to approach me and then ask question there, I'll help them and teach the lesson.--- So far ma'am, nobody approaches .. bu they already know ma'am. They just don't' contact.) (*interview with Teacher A, pp.28-29)
>
> ***
>
> Teacher C: So, it will give you an idea already if the students are engaged with the, with the task or with the lesson. That's every time! Every time if beyond your class hours if they still engage with you if they would ask further questions. That would be a good sign that they are engaged. I think uhh for me, engagement is one requirement for the students to learn. If they are not engaged, the opportunity for them to learn would be very small. (*Interview with Teacher C, p. 20)
>
> ***

Aside from actual observation of students' non-verbal gestures and time extension during consultation period, Teachers A and C also cited giving of short quizzes, seatwork and homework as another form of informal or formative PLA. These, however, mainly focus on assessing the students' ability to solve defined and structured word problems. In support to this finding, excerpts of Teacher C's statements on how PLA should be done is given below.

> Teacher C: Engagement. I mean the formative assessment so you have to very sensitive with the non-verbal the gestures. And it's, ba- it's -for me sometimes I give a short quiz specially the General Physics 1 now is I require the students to do analytical problem solving. --- Aahh -so I give a short simple quiz in fact I give just one example and they just twist it for some exercises.. it's quite traditional. --- Formative *ito.*(---This is formative).(*Interview with teacher C, p. 21)
>
> ***

The finding here showed that teachers' understanding of the PLA process was the inclusion of informal forms such as assessing students' level of engagement. This was viewed to be helpful to the students for the improvement of their understanding of and performance in Physics (Yair, 2000). Furthermore, the informal aspect of PLA process was viewed to be done through actual observation and response to the students' non-verbal gestures during class and engagement in consultation periods.

However, the understanding that student engagement could be generally indicated by the level of class participation during an activity contradicted some studies on the idea of "true engagement" (Wagettie et al, 2017; Wasserstein,1995). It was argued in these studies that "true engagement extends beyond students keeping busy and includes psychological aspects including self-motivation. Self-motivation comes from a desire to understand something interesting or learning in order to achieve personal goals" (Wassertein, 1995). Since true student engagement cannot be entirely indicated by the number of hands that are raised during a discussion, Wagetti et al (2017), through their designed instrument, claimed to provide a more systematic and "psychometrically sound" way of measuring true engagement. They added that their instrument was applicable to all grade levels and across disciplines (Wagetti et al, 2017).

Students' Ways of Understanding PLA: *Knowledge* Dimension

Table 9 shows key statements of the students' ways of understanding on what PLA means (*knowledge* dimension).

Table 9 Students' Ways of Understanding PLA in the *Knowledge* Dimension

Students' Ways of Understanding PLA (*knowledge dimension*)	FGD Group(s) Which Expressed the Given Understanding	Aspects in Focal Awareness
1.PLA is a tool for measuring students' knowledge and understanding in Physics.	Groups A, B, C and D (Groups A and D were from a private SHS while Groups B and C were from a public one.)	*PLA through written tests *summative aspect of PLA *analytical problem-solving skills
2. PLA is a self-evaluation tool used to determine one's ability to apply Physics learning in real-life.	Groups A, B and D (Had teachers who did not have a post-graduate level in physics education unlike Group C.)	*self-level evaluation *practical applications of PLA
3. PLA is a give-and-take relationship between teachers and students where the former give proper lessons and test and the latter study and take the test.	Group C and D (Both groups were the only two which had more females than males and more JHS awardees than non-awardees.)	*impact of teaching approach, students' effort and peers on student learning
4. PLA is an evaluation of teachers' teaching strategies.	Groups B and D (Both were the only two groups which were under the physics teachers who had applied science background.)	*teachers' and students' improvement

(1) PLA is a tool for measuring students' knowledge and understanding in Physics. This way of understanding similarly emerged in the awareness of the teachers as discussed in the earlier parts of this section. In the students' utterances, this was frequently expressed by all of the four FGD groups through the following verbs: measure, gauge, evaluate, and determine. This showed that regardless of the type of SHS that the students belong to, this understanding of the meaning of PLA was common to both public and private SHS in this study. Hence, this was how the Grade 12 STEM students in this study viewed the meaning of PLA. This view of PLA as a tool that is used for measuring students' level of understanding in Physics, is

found to be resonating with one of the teachers' views of PLA that was discussed in detail earlier (see discussion of the first entry of Table 6).

The aspects in focal awareness validated teachers' utterances that their actual PLA consisted mainly of written tasks that asked students to solve defined and structured problems. The students gave personal descriptions of PLA as the quizzes, seatwork, homework, problem sets and exams that they did to determine their level of understanding and knowledge in Physics. This implied that the summative aspect of PLA, mainly through written tasks, was at the center of the students' awareness on what PLA is. Below are quotations of some students during their focus group discussions (FGDs). These are given to support this part of the findings.

From FGD Group A:

> Jay: Physics learning assessment for me... how I is understand and how it is practiced today is through quizzes, exams, Ets (enabling tasks), seatworks, assignments... and enabling tasks...ok ma'am. That is the method that is practised now in assessing their students physics learning... so, yes ma'am, yun na ma'am... that;s how I understand it. (*FGD with Group A, p.11)
>
> ***
>
> Trish: *Ang* physics learning assessment ma'am for me *di ba yang sa* classroom setting is in the form of a test...*mga quiz para sa akin maam*... (*FGD with Group A, p.11)
> (Physics learning assessment for me ma'am in a classroom setting is in the form of a test....for me it's through quizzes ma'am...)
>
> ***

From FGD Group B:

> John: *Akoa maam, idea nako sa physics learning assessment murag, diria nga assessment iyahang evaluate, or murag i-assess niya if unsa imuhang mga natun-an sa physics.* As what we've said maam *na kanang... ang mga* assessment *namo na in a form of assignment or quizzes kay didtoa naay* different *na mga topics unya pagka human pag ma-*assess *ang amoang... ang unsa amoang na learn sa* physics *didtoa nga part sa quiz mao to... ay mao to ang ma tama namong answer... so murag kibali ang* physics learning assess or to evaluate *unsa amoang natun-an sa* physics. (*FGD with Group B, p.19)
> (For me ma'am, my idea of physics learning assessment is like an assessment which evaluates or assesses what you learned in physics. As what we've said ma'am that... the assessment that we have are in aform of assignment of quizzes where different topics are covered and assess our... what we learned in physics in that part of a quiz... or our correct answers... so physics learning assessment somehow evaluates what we learned in physics.)

From FGD Group C:

Ninna: *Ahm pagsabot siguro nako kay kanang kung unsa imung nasabtan sa physics gud ma'am murag test or kanang lets say questions ahm nga imung answeran kung kasabot ba jud ka sa concepts sa physics ma'am. Muarg ing-ato.*
(Ahm, in my understanding, maybe it's what you understand in Physics Ma'am and it's like a test or questions that you need to answer to know if you really understood the concepts in Physics Ma'am.) ((*FGD with Group C, p. 21).
***

Gem: *Ahm siguro ano, ahm evaluations sa tanang learnings,concepts sa physics kay ahm... physics is a broad ano branch of science so dili siya basta-basta dali matun-an man gud kay ahm... lisod siya aside from daghan kaayo kung ing-ani lang na concepts daghan na kaayong formula nga i-agi..."* (Ahm, I think it's evaluations of all learnings, concepts in Physics because..ahm.. physics is a broad branch of science so it's not easy to learn because ahm... it's difficult because aside from the several concepts, there are also many formulas.)((*FGD with Group C, p. 21)
***

Bethel: For me ma'am, it's like a part of a process to test or to measure how far we've learned, how far our understanding about physics like *murag gina-measure of course test kung na.. na learn ba jud namo ang concept and pwede and maka makabalo na ba mi kung unsaon ni siya pag-apply in real life...*
(For me ma'am, it's like a part of a process to test or to measure how far we've learned, how far our understanding about physics like it's a measure, ofcourse a test if you really learned the concept and know if we can really know how to use it in real life.) (*FGD with Group C, p. 22)
***

From FGD Group D:

April: *Ako po for me kay ang* Physics Learning Assessment measures your overall performance *kung maka follow kaba sa discussion kung or kung ahhmm kailangan mo pa mag-work on something. Parang it's a way to assess din somehow the teacher kung... kung clear ba pagka deliver ang concept. At tsaka sa amin din sa students,sa learners kung paano namin ma-understand, kung na-fully understand din ba nami ang concepts. And siguro evident sya sa paper works, sa mga quizzes, sa exams kung ano ang ang results kay it would reflect like gaano man din na understand or na na-answer na maayos ang questions.*
(As for me, Physics Learning Assessment measures your overall performance if you can follow the discussion or ahm... if you still need to work on something si it's like a way to assess also how the teacher or if the delivery of the concept is clear. And in our part as students, as learners, if we have fully understood the concepts. And perhaps it is also evident in paper works, in quizzes, in exams and the results would reflect how much is understood or if the questions are answered well.) (*FGD with Group D, p. 11)
***

(2) *PLA is a self-evaluation tool used to determine one's ability to apply Physics learning in real-life.* FGD Groups A, B and D expressed this kind of understanding of the meaning of PLA. Groups B and D were both from a public SHS while Group A was from a private one. Group C which was the only group that did not explicitly uttered this way of understanding was the only group who had a teacher (Teacher C) who who had post-graduate level on physics education.

There were two emerging aspects in focal awareness for this understanding. These were the emphasis on PLA as benchmark for self-level evaluation and the practical applications of PLA. Moreover, in this way of understanding, students viewed a higher and informal way of measuring their level of understanding and knowledge. This was done through informal evaluation of oneself, not just through written tests but ones that help the students determine their ability to practically apply Physics concepts in the real world. Practical application in this context involved applying Physics concepts in students' actual experiences of the physical world for a better understanding of how things were. Moreover, when the things which used to be trivial became appreciated and viewed through a more scientific lens after being understood in the Physics class, this realization was considered as a result of a higher level of PLA. In other words, the way of personally determining one's ability to see and understand the Physics concepts in action behind a real, actual and personal physical experience was a form of Physics Learning Assessment. This way was deemed informal because it could not be directly measured and given any score or grade like the usual written tests. However, students who had this way of understanding saw this aspect of PLA as being at the higher level than their usual classroom quizzes and problem sets.

The following excerpts of the selected students' statements highlight this way of understanding PLA.

From FGD Group A:

> Kea: *Ahm, physics learning assessment sa context ng classroom kasi it is in the form of a test, quizzes, or exams. Pero if sa akin as a person kay ang physics learning assessment parang yung ginasabi nila Jay, Kaye kanina na kapag magsakay kana ng jeep maiba na yung tingin mo ba kay marelate mo na sya sa lesson like relative velocity, motion, ma-connect mo na sya with your ano, physics learning assessment. Para sa akin as a person hindi sya ma-measure ng ano, kung ano gud ang makuha mo sa quiz sa classroom. Pwede mo man yan kunwari mag-assessment kayo sa classroom, what if hindi ka pala in good condition na yung time nayun pero ma-gets mo gud yung lesson. Pero parang hindi sya accurate, hindi sya ganun ka accurate for pag sa classroom pero pag sa in real life ba. Pero saakin kay parang.. akin kay*

measure ang physics learning assessment sa classroom ky ano lang sya yang estimate lang gano ka talaga kadami yang iyong na-learn hindi talaga gaano as a person gud yung maapply in real life.
(Ahm, physics learning assessment in the context of a classroom, it is in the form of a test, quizzes, or exams. But for me as a person, physics learning assessment is similar with what Jay and Kaye mentioned earlier that if, for example, you ride in a jeep, you'll have a different way of looking at it because you can relate it, for example, with relative velocity, motion, you can connect with physics learning assessment.For me as as a person,you cannot measure it how much one gets from a quiz in the classroom. For me, if you are having an assessment in the classroom, and'what if you're not in good condition but already understood the lesson. So it is not that accurate if in the classroom than when in real-life. But for me, the measure of physics learning assessment in the classroom is only and estimate of how much one have learned and not how as a person can you apply things in real-life.)(*FGD with Group A, p. 10).
***
Phil: A for me ma'am the physics learning assessment for me in the same context in the classroom not really accurate. Physics is a science that is dealing with objects or things that is found in the real world and then I don't think that it is an offer someone to assess student but his or her physics learning, conceptual or theoretical understanding of physics ma'am. It must also be for me like the lab activities ma'am. It is the concept that put it in real life that ahmm.. for me in this structure of our general physics I don't think it is fair, it's enough or accurate that there are more quizzes. It is relating to the conceptual and theoretical parts of physics rather than just one lab session compared to numerous exams and quizzes." (*FGD with Group A, p. 11)
***

From FGD B:

Lexy: *Siguro maam, kay kailangan... it could be better kung kanang naa gyud actual na ano maam, kanang actual na application jud ba. Kay sa ano kay usahay langman gud kanang naay actual na more on solving-solving lang tapos usahay man gud maam, hehe! (laughs) kung mag-answer ka sa isa ka ano, maghatag ug problem si sir then answer-answer ka, dili man gud katuohan usahay maam ahh...ang values ing-ana.. ing-ana tapos murag kanang murag better siya kung kanang naa juy actual nga kuan maam ba para mas masabtan pud nga kanang naa juy application para mas masabtan sad namo. 'Tas kanang for example kanang projectile motion na ana-ana, kung kanus-a ba jud magamit sa mga basketball player ug mo-shoot sila, ana-ana gani ma'am.*
(Perhaps ma'am, it should...it could be better if there is really actual application. Because sometimes there are applications but more on solving only and sometimes, hehe! (laughs) as you are answering a problem, Sir gives you a problem and then you answer it, but the resulting values are not believable, so it would be better if there is an actual part so that we can really understand it if there are applications. Then, for example in projectile motion and things like that, when do basketball players use it as they shoot, things like that ma'am.) *FGD with Group B, p. 22)
***
Toni: *I-apply jud siya mam ba real life kanang naa gani application, nga kami gyud mismo mubuhat kay dili kanang... activity jud m'aam kuntahay mag-adto mi sa court kanang ingun ana gud maam. Niya katong gibuhat na magbasketball, i-measure-measure kay ang ginabuhat man gud nila karun maam kay murag ginapa-imagine gud sa amoa, unya murag lisod biya i-imagine lang gud sa amoa unya murag lisod biya i-imagine kung dili ka ka relate ani maam, ani biya."*
(It should be (It should have applications in real life which we should be doing and not... an activity ma'am for example we go the court, like that ma'am. Then in playing basketball, we do measurements because that we are doing now is we are only asked to imagine things, and just imagining is really difficult for us if you cannot relate with it ma'am, it's like that.)
(*FGD with B, p.23)

***

Queen: *Kanang unta ang assessment is realistic siya like...Katong ano like last time nga katong sa among quiz is ana naay woman na nag push ug cart after pila ka second pila iyahang velocity. Na-shock mi maam kay 20 meters per second , like wow! Siya si Flash?"* (laughs)
(It is hoped that assessment be realistic... in our previous quiz last time, there is a woman who pushed a cart and what is her velocity after a few seconds. We were shocked that it was 20 meters per second, like wow! Is she Flash?" (laughs) (*FGD with Group B, p. 25)
***

From FGD Group D:

Romel: *Ahmm ...physics learning assessment kay I believe it's not only, ayyy.. it's not limited lang sa mga paper works.. though wala pa namo na experience so far pero ano man pud pwede man pud sya sa ano mga practical like diba ang mga Physics ano for... about machines, o dili ba about mga work-work kung i-apply nato na sa technology, diba ang uban na mga students sa physics-related courses kay mag-build sila'g mga robots... machine... so ang assessment ma-apply pud nato, ma-apply nato kung kanang mag-assess ug ahh... kanang ang teacher i-assess niya ang students kung kabalo na ba mohimo ang students ug ano.. mo-operate ug machine or maghimo'g machine.*
(Ahm... I believe physics learning assessment is not only ...ohh... it's not limited only to paper works... though we have not experienced it so far but it may also include practical like in Physics, about machines, orthe concept of work if applied in technology, some students in physics-related courses, they build robots... machines.. so in the assessment, we can apply ahh... the teacher must also assess the students if they know how to.. how to operate a machine or build a machine.) (*FGD with Group D, p. 12)
***

This way of students' understanding also emerged in the teachers' conceptions earlier (see discussion of the third entry of Table 6, teachers' ways of understanding PLA). There were similarities and differences though. The similarity was on the emphasis that both the teachers and students put on the informal way of PLA. Such type of PLA was viewed to determine students' ability to apply Physics concepts learned in understanding the physical world. Moreover, this type of PLA emphasized by the teachers corresponded to the laboratory activities and performance tasks which yielded students' scores and grades. On the other hand, students put more emphasis on the informal ones, those not scored nor graded. This was through self-level evaluation on whether one was able to understand and appreciate the Physics behind a certain personal experience or not. Groups A and D were both from a private SHS while Group B was from a public one. All of these groups were under physics teachers who had no post-graduate level in physics education unlike Group C. This showed that preference to real-life context in PLA was common to both types of SHS.

(3) *PLA is a give-and-take relationship between teachers and students where the former give proper lessons and tests and the latter study and take the tests.* FGD Groups C and D expressed this way of understanding the meaning of PLA. Based on profile characteristics, they were from different types of SHS but more than half of both groups were females. These were also the top two groups with the highest number of JHS awardees among the four groups.

In this way of understanding, three aspects in focal awareness emerged. These were the perceived impact of teaching approach, students' effort and role of peers in Physics learning. The students perceived the primary role of teachers in PLA as designer, facilitator and interpreter of the PLA forms and results.The forms of PLA that were focused here were written tests such as quizzes, problem sets and exams. Students' utterances implied that a well-designed PLA had a positive impact on their understanding. It was also understood to be one that provided opportunity for students' active learning (Prince, 2004) and yielded to realistic answers.

Students' utterances also put emphasis on their role in PLA as the performer or doer of the written tests designed by their teachers. In preparing oneself for the said role, students perceived that this could be done by monitoring their ability to answer correctly (as reflected in their test scores) and by studying and practising at home. Ability to teach or explain Physics concepts to their peers was seen as another way of fulfilling the said role. This view corresponded to the utterances of some students about their interaction with their peers as indicator of their Physics learning. Some students shared that they knew that they have gained Physics learning when they could answer most of their classmates' questions on a certain concept, when they could articulate their explanations to their peers and when their answers and solutions are the same as their smart classmates'.

To provide support for this finding, the following are excerpts from FGD Group C:

> Ninna· *For me ma'am syempre teacher, ang akong sarili ugang akoang peers ma'am... like ang sa teacher... ang teacher ma'am kay magtudlo diba siya ma'am? Ang kanang maghatag siya ug kanang mga quizzes, ahm... problem sets and stuff, niya answeran nimu siya to test. Ay! Kanang answeran nimu siya tapos i-check sa teacher kung tama ba... kung tama ba imung answers ug tama ba imung pagsabot sa concepts. So murag siya ang naga-assess sa imuhang learning sa iyahang gitudlo. Sa imuhang sarili ma'am kay with ahm... with those ano assessment na imung gi... gi-take, kay murag ano paman siya ma'am murag i-test imung sarili, ay! i-assessment sa imuhang sarili ma'am, self-assessment ma'am kung natun-an ba jud ba na nimu ang topic ma'am, kung nakasabot ba jud ka. Kung di man nimu siya ma-answeran kung wala ka kasabot so... so murag ing-ato ang sa self...self assessment. Sa peers ma'am kay kung parehas atong giingon ni Rozano kay kung makatudlo ka sa ilaha, ma-explain nimu sa ilaha ang concepts meaning nakasabot jud ka sa topic sa physics ma'am.*
> (For me ma'am, ofcourse the teacher, myself and my peers... the teacher teaches, right ma'am? She gives quizzes, ahmm... problem sets and stuff, then you answer it to test. Oh! You answer it then the teacher checks if it is right... if your answers and understanding of concepts are correct. It's like she assesses your learning of what she has taught. In yourself, ahmmm.. with those assessments that you take, it's like you test yourself, oh! You assess yourself if you really have understood. With the peers, it's the same with what Rozano's... so it'slike self... self-assessment ma'am if your have really learned the topic. You cannot answer it if you do not understand so... that's what self-assessment it. With peers, it's the same with what Rozanosaid the if you can teach them, if you can explain the concepts to them, it means that you understood the topic of physics ma'am.) (*FGD with Group C, p. 22-23)
> ***

From FGD Group D:

> Lhea: I think the Physics Learning Assessment should be done both... it's like give-and-take relationship *kay 'pag gawin ng teacher na ganito ang trabaho, ganito din outcomes ng student. 'Tas pag ang student ganyan din ang outcome nya parang mag ano sya ba mutual ang kanilang pag ahhm.. pag-perform or kanilang pag-give ng assessment to each other...*
> (I think the Physics Learning Assessment should be done both... it's like give-and-take relationship because if the teacher does his or her job like this, students' outcome will also be like this. Then if the students has this kind of outcome it's like they have a mutual... ahhmm... performance or the way they give assessment to each other...(*FGD with Group D, p.14)
> ***
> Lhea:... *parang if the teachers give this kind of question, dapat magbigay din sya ng way na maka-answer yung student na ganun na question.. parang maka-answer ,parang turoan din nya ang student how to answer these questions. So di lang parang sometimes magaling masyado 'tas mag-give ng question na hindi na ma-answer, isipin na superhuman yung student.*
> (It's like the teachers give this question, then he/she must give a way for the students to answer that kind of question... for them to answer, it's like he/she teaches the student how to anwer these questions. So it should not be like sometimes the teacher

is so good but gives questions that cannot be answered, and think that the student is superhuman.) (*FGD with Group D, p. 15)

In summary, the students' understood PLA as a dynamic interaction among the role players, namely: the teacher, students and peers. It was further revealed that the students perceived a good Physics performance (as reflected by their written tests scores) as a composite result of having a well-designed PLA and their effort in studying and preparing for it, together with the contribution of teaching their peers. A well-designed PLA corresponded to what Clements and MacDonald (1996) referred to as the "ethical responsibility for student assessments". This included ensuring that a given assessment was appropriately designed and measured what it claimed to measure (Clements and MacDonald, 1996). This way of students' understanding of PLA,however, did not emerge to be central in the teachers' understanding but found to be distinct to the students only.

(4) *PLA is an evaluation of teachers' teaching strategies*. This way of understanding the meaning of PLA was articulated by FGD Groups B and D. Although more than half of Group B expressed disliking to learn Physics, all eight students in Group C expressed otherwise. However, common to both groups only was their being under the physics teachers who had applied science background (engineering and applied physics for Teachers B and D, respectively).

The emerging aspect in focal awareness in this way of understanding was the perceived impact of the success or failure of a teacher's teaching approach on students' Physics learning. Students who had this view implied that the primary factor that led to high or low scores was the level of effectiveness of a teacher's instructions. Hence, PLA is consequently viewed as a way for a teacher to evaluate the said aspect of his or her teaching. This way of understanding that a students' level of learning is primarily reflected in their tests scores and entirely dependent on the kind of teaching approach resonated with the study of Kupermintz (2002). Kupermintz (2002) presented that the belief that "test scores are directly related to the quality of teaching effectiveness" was strong among policy-makers and funding agencies from the public and private sectors. There were also recent studies that reported a direct relationship between the quality of the effectiveness of teaching and student learning (Darling-Hammond & Young, 2002).

On the other hand, Ding and Sherman (2006) pointed out that the main question was not on whether teachers' evaluation scores were associated with student learning or not. Rather, it is only when students recognize their responsibility in their own learning that "issues related to teacher effectiveness and teacher effects" are addressed (Ding and Sherman, 2006).

The following excerpts of students' statements from FGD Group B are given below in support to this finding.

> Roel: *Sa kong pagsabot sa Physics learning assessment maam kay murag dili lang siya evaluation sa imuhang na learn, murag ano pud siya part siya assessment pud siya the way sa pagtudlo siguro sa teacher, sa mga ginahatag na murag learning material sa amoa, tapos mga activities na gina-paano sa inyo para in order na mas effective ang learning sa isa ka student sa certain ka topic... so kung effective ba ang iyahang way na pagteach para masabtan para sa students."*
> (In my understanding of Physics learning assessment ma'am, it is not just an evaluation of what you learn, but it's like it's part of assessing the way a teacher teaches, on the learning materials that are given to us, and the activities that you are asked to do in order for a student to learn a topic more effectively... so if the way of teaching is effective for the students to understand.) (*FGD with Group B, p. 20)
> ***

From FGD Group D:

> Lara: *Parang same idea din kay April like ang Physics Learning Assessment hindi lang sya nagalimit sa students lang ang naga-learn ng physics pati sa teachers like kung paano nila... kung paano nila ituro yun mag reflect talaga yun sa student.. yun talaga masabi ko, hahaha! So kung maraming mabagsak...* (laughs)
> (It's like the same idea with April like Physics learning assessment is not limited only to students who learn physics but also the teachers on how they... how they teach reflects on the student, I can really say that, hahaha! So if many students fail... (laughs). (*FGD with Group D, p. 13)
> ***

Students' Ways of Understanding PLA (*Purpose* Dimension)

The emerging aspects in focal awareness and students' conceptions of why PLA is given are presented in Table 10.

Table 10 Students' Ways of Understanding PLA in the *Purpose* Dimension

Students' Ways of Understanding PLA (*Purpose*)	FGD Group(s) Which Expressed the Given Way of Understanding	Aspects in Focal Awareness
1.PLA is given as a source of students' grades.	Group A (Had the most number of males and the youngest physics teacher.)	*practical aspect of PLA *future dimension of the purpose of PLA
2.PLA is given to evaluate students' level of understanding in Physics.	Groups B and D (Both were the only two groups which were under the physics teachers who had applied science background.)	*analytical problem-solving skills *PLA for student self-reflection
3. PLA is given to determine the effectiveness of teachers' teaching strategies.	Groups B and C (Both from a public SHS and the only two groups which were under physics teachers with regular employment status, teaching experience of more than five years, and involvement in SHS teachers' content training in physics.)	*impact of instruction on student scores *scores as indicator of the effectiveness of a teaching strategy

(1) *PLA is given as a source of students' grades.* FGD Group A expressed this way of understanding the purpose of PLA. Group A from a private SHS was distinct in its being the group with the youngest and most inexperienced physics teacher and with the highest number of males than females. There were two emerging aspects in focal awareness in this conception which were the understanding of grades as the fundamental purpose of giving PLA and the impact of

having good Physics grades on one's future. For the first aspect in focal awareness, the primary reason of giving PLA to the students was understood to be basic and fundamental as it was viewed as the sole source of students' grades. In other words, there would be basically no Physics grades for the students should there be no PLA given to them. The purpose of PLA was understood to be the means to an end which was the Physics grades.

For the second aspect in focal awareness, the purpose of PLA was viewed as providing a driving force for the students to strive hard, pass their tests, get good grades and eventually have good employment in the future. This revealed another layer of this conception, the perceived future dimension of the purpose of PLA. Students live in and experience a certain culture in school and community where good scholastic record and achievements are viewed by society as a ticket to better careers and future. This view was deemed as culturally rooted (Vatterott, 2015). Vatterott (2015) emphasized that the "modern culture routinely rewards good grades, hence, reinforcing the belief that these are markers of future success". However, Vatterott (2015) added that although "high grades help students get into college, these do not necessarily prepare them academically to succeed in college". Culture was seen here to shape the students' way of understanding the purpose of PLA.

Aside from having good grades, the students expressed that the Physics knowledge that was transferred from the teachers to them through PLA was understood to be necessary for them to become productive members of the society in the future. The following excerpts are the selected statements from FGD Group A which highlight and support this finding.

> Trish: *Kung sa school lang ma'am, kailangan sya (PLA) because of grades, ganyan-ganyan... pero if tingnan natin in a big picture, kasi tayo yung students, is ang future gud ma'am. So pagmalearn nila ma'am yung mga concepts ng mga physics, gamit din ito sa pagdevelop ng mga things sa world gud ma'am, so ang mga teacher na yan*

ma'am wala naman sila sa future so parang ipass, hehehe! I-pass na nila sa mga students ma'am ang mga concepts na dapat nila malaman ma'am.
(In school ma'am, it's really needed because of grades, like that... but if you look at it in the big picture, because we the student are the future ma'am. So if they learn the concepts in physics, these can be used to develop things in the world ma'am, so the teachers ma'am will no longer be around in the future so it's like they pass it, hehehe! They pass the concepts that the students need to learn ma'am.) (*FGD with Group A, p. 17)
***

Jay: Ahm, the physics learning assessment is of course ahm... *maingon naku sya ma'am na mura sya'g, mura sya'g kanang para ma-force ang student na maglearn ahm... para mopasa ka, dapat man na dako ka ug assessment. Magkaroon ka ug grade and then pagmakapasa ka, magkaroon ka ng job ang everything, ganyan-ganyan.*
(Ahm, the physics learning assessment is of course ahm... I can say ma'am that it's like, it's like it's something that forces a student to learn, ahm... in order to pass, you must have high score in the assessment. You get grades and then when you pass, you will have a job and everything, things like that.) (*FGD with Group A, pp. 17-18)
***

(2) *PLA is given to evaluate students' level of understanding in Physics.* This conception is a reiteration of the students' understanding of the meaning of PLA (see earlier discussion of the first entry of Table 9). Consequently, the same aspects in focal awareness emerged which were the analytical problem-solving skills and PLA for student self-reflection. It was evident in the students' sharing how they utilized their test scores in PLA as a point of reflection for self-improvement. Areas in the tests where they committed mistakes were deemed points for improvement in their Physics learning. In other words, it was perceived that PLA was given to them not just to determine how much they understood, but to help them realize the areas that need improvement.

FGD Groups B and D both expressed this way of understanding the purpose of PLA. The profile characteristic that was true only for these groups was the applied science background of their physics teachers (engineering for Teacher B of Group B and applied physics for Teacher D of Group D).

The following excerpts are taken from selected FGDs with the students from Groups B and D. These are cited in support to the finding discussed in this sub-section.

From FGD Group B:

Jake: *Akoa maam, idea nako sa physics leaming assessment murag, diria nga assessment iyahang i-evaluate, or murag i-assess niya if unsa imuhang mga natun-an sa physics. As what've we've said ma'am na kanang ang mga assessment namo na in a form of assignment or quizzes kay didtoa naay different na mga topics unya pagka human pag ma-assess ang amoa.. unsa amoang na- leam sa physics didtoa nga part sa quiz mao to, ay mao to ang ma tama namog answer so murag kibali ang physics learning assess or to evaluate unsa amoang natun-an sa physics."*
(For me ma'am, my idea of physics learning assessment is like, this assessment evaluates, or it assesses what you have learned in physics. As what we've said ma'am, our assessment are in a form of assessment in a form of assignment or quizzes where there are different topics and assess our... what we learned in physics are shown in our correct answers so in away, physics learning assess or to evaluate what we learn in physics.) (*FGD with Group B, p. 19)
***

From FGD Group D:

Matt: I think... I think quizzes are really part of PLA *kasi hindi man...* we cannot, *ay!* For me *ha, kasi like yung, yung sinabi ni Andrew, yung may mga mali at least you know na,"ah dito may mali ako* I have to do... I have to correct this or I have to learn from my mistakes". -- Self-assessment gud like gina-assess ng teachers na may certain criterias ka na mga like, "oh ay poor ka ditto, ok ka, very good ka dito sa paragraph". Ganun lang din sa physics when you receive your results na, ay kulang pa ako dito na part so I have to improve more.."
(I think... I think quizzes are really part of PLA because it's... we cannot, oh! For me, it's like what Andrew said, for one's items with wrong answers, you would know that, "I have a mistake in this part so I have to... I have to correct this or I have to learn from my mistakes". -- In self-assessment which a teacher assesses with many criteria like, " Ohyou are poor in this area, you're doing okay, and a very good in paragraph". It's also like that is physics when your receive your results, I still lack in this part so I have to improve more... (*FGD with Group D, p. 11)
***

(3) *PLA is given to determine the effectiveness of teachers' teaching strategies.* FGD Groups B and C both expressed this ways of understanding the purpose of PLA. Aside from Groups B and C both belonging to a public SHS, their other common profile characteristic was the three distinct characteristics of their physics teachers (Teachers B and C, respectively): regular employment status, teaching experience of not less than five years and involvement in physics content training of SHS teachers in their school. More than half of each group expressed a disliking in learning about physics unlike the other two groups from the private SHS (Groups A and D) which all signified otherwise.

This view is another reiteration of one of the students' way of understanding the meaning of PLA (see discussion of the fourth entry of Table 9). It was again noted here how the students gave the same understanding on the meaning and purpose of PLA as overlapping with each other. Moreover, the aspects in focal awareness were revealed to be the perceived impact of instruction on student scores and scores as indicator of the effectiveness of a teaching strategy. In the context of the students, teaching strategy was understood to be involving everything that a teacher did or used during actual teaching such as the teaching method, materials used and attitude towards students.

To support this finding, selected excerpts from the FGDs with the students are given below.

From FGD Group B:

> Harry: *Ang para sa akoa ang physics learning assessment is just like Janna and Jake said, ang evaluation sa... maybe sa learning material strategy na gigamit sa teacher gud, particularly kung makasabot, kung naa ba juy understanding like after all of you've done as a teacher... unya naa ba jud 'day nasabtan ang studyante niya.. murag more on kanang importance kung na-impart ba jud or na- plant ba jud ang knowledge dira sa physics sa isa ka estudyante maam.*
> (For me physics learning assessment is like what Janna and Jake said, it is an evaluation... maybe in the learning material strategy that is used by a teacher, particularly if there really is understanding after all you've done as a teacher... and if there is really understanding among his/her students... it's more on the important if knowledge in physics has really been imparted or planted in a student ma'am.)(*FGD with Group B, p. 20)
> ***

From FGD Group C:

> Luane: *Dako jud ug role ang mga teachers ma'am kay dependent ang ang knowledge na natun-an sa student sa mga teachers gud kay, kay naka depende pud na siya sa teaching style sa teacher kung nakatuon ang student kung wala nakatuon ang student, then fault na na sa teacher. Naga-reflect sa student kung unsa ang performance sa teachers.* Hehehe!" (students laugh)
> (Teachers really have a role ma'am because the knowledge learned by the students is dependent on the teachers, because it also depends on the teacher's teaching style whether or not a student learns then it's the teacher's fault. Teachers' performance is reflected on their students.) (*FGD with Group C, p. 24)
> ***

The analysis of the students' ways of understanding the prupose of PLA (*purpose* dimension) were presented. The succeeding sub-section presented the analysis of the students' ways of understanding the process of PLA (how PLA is done). Table 11 below shows the captured ways of understanding PLA in the process dimension.

Students' Ways of Understanding: *Process* Dimension

The captured ways of students' understanding of how PLA is done are shown in Table 11.

Table 11 Students' Ways of Understanding PLA in the *Process* Dimension

Students' Ways of Understanding PLA (*Process*)	FGD Group(s) Which Expressed the Given Way of Understanding	Aspects in Focal Awareness
1.PLA must be given before, during and after a lesson through written tasks.	Groups A and C (Group A had the least number of females while Group C had the greatest. Both groups were the only two which were under physics teachers who had no applied science background.)	*experiences of assessments in Junior High School *summative aspect of PLA
2. PLA must emphasize the practical applications of the learned Physics concepts.	Groups A, B and C (Group A was from a private SHS while B and C were from a public one. Unlike Group D, the physics teachers of these three groups had education degrees major in science teaching and were all licensed professional teachers.)	*real-life and practical applications of Physics concepts
3.PLA must be engaging.	Groups B and D (The only two groups whose physics teachers had applied science background.)	*motivation for students to study Physics not just for the grades *variety of PLA forms *formative aspect of PLA
4.PLA must include peers for self-assessment.	Groups B and C (Both from a public SHS and the only two groups which were under physics teachers with regular employment status, teaching experience of more than five years, and involvement in SHS teachers' content training in physics.)	*role of peers in self-assessment

(1) *PLA must be given before, during and after a lesson through written tasks.* FGD Groups A and C articulated this way of understanding how PLA is done. Common to both groups was the background of their physics teachers which was entirely and directly aligned with science teaching, in contrast to Groups B and D whose teachers had engineering and applied physics background. Group C had the most number of JHS awardees (8 of 8) while Group B had the least (3 of 8).

In this conception the emerging aspects in focal awareness were the students' experiences of assessment in Junior High School and the summative aspect of PLA. The impact of the students' positive experiences of assessment in the past was recalled by the students as revealed in their utterances and expressions. Students' past experiences of the process of assessment in their previous school served as basis for their present view of how PLA should be done. The influence of past experiences on how an individual understands his or her present world (Motlhabane, 2016) was revealed in this part of the analysis.

Further analysis showed that in this way of understanding, the process of PLA was understood to be mainly centered on the forms of PLA that were bases for the students' grades such as written tests, exam and projects (DepEd Memo #8, s. 2015). Hence, the summative aspect of PLA was at the focal awareness.

Given below were the statements of the student that supported this finding.

From FGD Group A:

> Jay: *Aah for me ma'am physics learning assessment hindi lang after the lesson ma'am but also before and during lecturing. For me maam, as what we have practiced in our previous school maam, before taking the lesson there is what we call pre-assessment test. The teacher assesses the stock knowledge of the student to be aware on what level of competence do the student have with regarding the topic and the subject ma'am, so with that ma'am the teacher ma'am will be aware kung saan talaga sya magfocus magteach kaysa naman i-topic pa nya lahat from the beginning of the topic na alam naman ng student pala.*--- During the lesson ma'am there will be board works, seatworks, or other activities."
> (Aah for me ma'am physics learning assessment is not just after the lesson ma'am but also before and during lecturing. For me ma'am, as what we have practiced in our previous school maam, before taking the lesson there is what we call pre-assessment

test. The teacher assesses the stock knowledge of the student to be aware on what level of competence do the student have with regarding the topic and the subject ma'am, so with that ma'am the teacher ma'am will be aware on what topic to focus his/her teaching into rather than teaching everything from the beginning while the students already know it. During the lesson ma'am there will be board works, seatworks, or other activities.) (*FGD with group A. p. 14)

***

From FGD Group C:

Gem: *Siguro ma'am ahm... ang akong na-experience sukad atong ano Junior High ug kanang i-compare nako ang Junior High, hehehe! ug karon, kay nag-physics man mi sa Junior High, is mas masabtan nako ang... ay! kung ako siguro ang teacher is kinahanglan man siguro na ang physics kay ipasabot man jud nimu sa bata so magsugod jud ka ug kanang explain ngano ing-ana ang concept sa physics and then didto ka magsugod ug hatag ug examples, real-life examples. Dapat magsige ka hatag ug real-life examples para mas masabtan sa bata ngano ing-ana ang pagdagan o ngano ing-ana ang pagkuha sa isa ka butang or ngano ing-ana ang pag-calculate sa formulas ug ing-ana pag-derive sa equations kay kung magsige na lang ka'g hatag ug kanang concepts, concepts, concepts, so unsay matun-an sa mga bata na murag magtanga sila? Ngano giing-ana man sa teacher? Asa na gikan?*

(Maybe ma'am ahmm.. my experience before in the Junior High School and if I compare the Junior High, hehehe! and now, because we had physics in Junior High, I would understand better... oh! I fi were the teacher maybe it's really a must that physics be taught to the students so you really need to explain why a physics concept is like that and then you can start there by giving examples, real-life examples. You should always give real-life examples for the student to undertand why it goes like that or why it is calculated through formulas and how to derive equations because if you only keep on giving concepts, concepts, concepts, what do the students learn from it if they do not participate? Why did the teacher do that? Where did it come from?)(*FGD with Group C, p. 25)

***

(2) *PLA must emphasize the practical applications of the learned Physics concepts.* FGD Groups A, B and C expressed this way of understanding the process of PLA. The students who shared this understanding emphasized that PLA must go beyond measuring their ability and rate to solve word problems. Instead, PLA process must include the provision of opportunities for the students to test their abilities to solve real-life problems as practical applications of the learned Physics concepts. These three groups shared a common profile characteristic which Group D did not have. This was the science education undergraduate degree and professional teacher's license which their teachers had. Their teachers also did not have any research experience in industry which Teacher D (teacher of Group D) uniquely had.

It was also observed that as the conversation between the students (Group C in particular) and the researcher centered on the students' understanding about the PLA process, they tended to ventilate their issues and concerns with their teacher and the classroom practices. The researcher had to remind them that the FGD was not focused on resolving issues with their teachers but only in listening to and describing their conceptions of their experiences of PLA (Anderberg, 2000). The students' depth of sharing indicated the degree of trust that they gave to the researcher, an important aspect that must be present in qualitative methods such as this study.

Finally, this way of understanding also emerged in the teachers' conception of the meaning of PLA (see earlier discussion of the first entry of Table 6). It was seen in both the teachers and the students the aspiration of a kind of PLA that gives focus on practical and hands-on forms of assessment and instruction in general. However, they also acknowledged that this remained an aspiration as of the present primarily due to limited resources of time and laboratory equipment. This finding echoed several studies on the plight and status of science education at the midst of an educational reform. One that was at an extreme was emphasized by Borman (1996) as she described that "conditions that hinder effective innovation more often occur in troubled communities whose resources are often diverted to crisis management". She added that "unhealthy organizations are unlikely to correctly diagnose their problems, identify effective strategies, implement the strategies with requisite strength and fidelity for them to make a difference and improve their practices over time".

The following are selected excerpts of the FGDs with the students. These were highlighted in support of this part of the analysis.

From FGD Group A:

Kea: Physics Learning assessment *kasi dapat more on sa labs sya like, laboratory experiment, report kasi doon man talaga maapply, kung gaano karami ang nalearn ng studyante. Atsaka, doon talaga kayo parang practical activity ba yong gamitin mo talaga yung iyong mind din gamitan mo pa talaga ng physical aspect like yong kamay para maperform mo ang isang bagay. 'Di lang katulad ng papel na parang mga papel sa exam gud, ay magsolve-solve ka lang. Mas maganda gud talagang may gawin kayo kasi doon mo talaga, ah ito application talaga ng iyong knowledge."*
(Physics learning assessment should be more on labs like laboratory experiment, report because it's through these where one can really apply how much the students have really learned. And that is really where you use practical activity where you really use your mind and there's really the physical aspect like your hands are performing a thing. Unlike in a usual paper that you use in an exam where you just keep on solving. It's really better if you are actually doing it because that is really the applicationof your knowledge.) (*FGD with Group A, p. 16)
***

Eman: Yes, ma'am in the real-world application ma'am, example in creating building ma'am, the structures, we can apply physics... there should be physics learning assessment for it could be for our learning to be accurate and correct and that we may... and ensure safety and the credibility of our outputs." (*FGD with Group A, p. 17)
***

Phil: Ma'am, it should be both conceptual and practically assessed ma'am, because for example in biology, learners would easily grasp the concepts of cells if they see the cells themselves ma'am, and for us in physics it is better if we are ahmm.. we are assessed with what is in our, how we understand the physics concepts in the words.. not in.. or in formulas but in real life." (*FGD with Group A, p. 16)
***

From FGD Group B:

Lexy: *Ay in addition pud maam kay most of the times pag naay problem ihatag sa amoa, memorize daw namo kuntahay ang formula. Mangita lang mi'g ani nga given lang siya so murag i-substitute-substituate lang namo. So kanang feeling namo na tama na ni kay naa naman siya didtoa. 'Tas murag wala lang gud, di gud kaayo namo siya masabtan..."*
(In addition, too ma'am, most of the times if we are given problems, we just memorize the formula. We'd look for any given and then simply substitute. So it feels correct because the given is there. Then it's like nothing, you really did not understand it...) (*FGD with Group B, p. 24)
***

From FGD Group C:

Karen: *Siguro* ma'am more on practical application *siguro sa physics kay lisod siya kuanon... kay daaghan man gud ug factors like sa* air resistance... *dili jud na makita sa textbook, for example naay bola nga nikalit lang ug kahulog.* What if, what if,*puro lang* what if, hehehehe! --- *Unta* practical applications... *sa* application *siguroniya* ma'am *kanang dili lang siguro nga* necessary na i-solve jud kay dili man ideal na conditions ato... (*FGD with Group C, p. 26)
***

(Perhaps ma'am it should be more on practical application because it is difficult to... because there are several factors like air restistance... it cannot be seen in the textbook, for example there's ball which suddenly falls. What if, what if, everything is "what if", hehehe! --- I hope it's on the practical applications...maybe an application ma'am and not necessarily to be solved because the conditions are not ideal there...)

(3) *PLA must be engaging.* This was expressed by FGD Groups B and D. Unlike Groups A and C whose teachers only had education undergraduate degrees, Groups B and D's physics teachers had engineering and applied physics degrees. In this way of understanding PLA process, the emerging aspects in focal awareness were the following: motivation for students to study Physics not just for the grades; variety of PLA forms; and formative aspect of PLA. For the first focal point, students expressed that PLA must not be focused on mere problem-solving that often becomes mechanical. Giving engaging forms of PLA that are motivating enough for the students to do even without any equivalent grade is a must. Consequently, this called for the second focal point which stressed that variety in giving PLA forms should consider the different learning styles of the learners (Allen et al, 2011). The students understood that PLA must also be done in different ways which are appropriate for each learning style. For those who were visual, solving word problems may be good for them while the kinesthetic ones had to be given practical tasks where they could manipulate tools and work with their hands.

Furthermore, an engaging way of doing PLA was perceived to be involving non-graded and repetitive practices. Non-graded oral recitation where students are given the opportunity to explain and defend their answers were favored more by the students over plain and graded problem-solving. This was an indication that the students placed the formative aspect of PLA at the center of their awareness of how PLA must be done.

Below were excerpts from the students' FGDs which supported this part of the finding.

From FGD Group B:

> Lexy: *Ano maam, katong gi-ingun ni Queen na ano daw kanang 'tahay sa isa ka-topic niya acceleration ang topic, kay kung mag-assessment daw unta kay kanang lahi-lahi na types. Naay assessment na kanang written, tapos naa poy kanang kanang pratical*

na ano, kay murag gi-ingun ni Harry ba na lain-lain mang gud mig ano maam, sa amoang pagsabot ba. So katong mga tao nga ano kaya lang nila nga solve-solve lang niya kami kay ug mu ingun nga, "nasabtan man lagi niya bi? Dapat masabtan pud ninyo". Niya kanang lahi man gud ang way nga ano kanang murag mas dali sa amoa na practical. Ana-ana gani maam, so sa isa ka topic dapat different kind of assessment."
(Just like what Queen said ma'am that if for example the topic is acceleration, the assessment must have varied types. There is written assessment, then there has to be practical, too, because like what Harry mentioned that we have different ways of understanding ma'am. So those people who can do solving but some of us cannot then something will be said like, "how come he/she understand it? You mush understand it, too". But doing it in practical is much easier for us. It's like that ma'am, so in one topic, it should have different kind of assessment.) (*FGD with Group B, p.26)
***

From FGD Group D:

Bethel: *Like, aside sa ingon ni Ninna, para sa akoa ma'am mas maka-learn ko through visual jud so akoang ginabuhat pag wala jud ko nakasabot jud sa concept, kaning nagatan-aw ko sa video... sa video sa youtube, tapos ginatan-aw nako after nako ma-watch ang video, effective jud kaayo siya para sa akoa like kung if i-incorporate ni sir.. ay.. ay ni Sir ahm.. pag video presentations with all the concept, with all the problem solving, I guess after sa physics learning assessment for sure na maka... maka... naa ju'y ma-learn ang mga estudyante."*
(Like, aside from what Ninna said, I learn more through visual so what I do everytime I do not understand a concept, I watch video... video in youtube, then after I watch the video, it's really effective for me if I incorporate with Sir.. ahmm.. with Sir... if the video presentation have all the concept, with all the problem-solving, I guess after a physics learning assessment for sure... students will really learn.) (*FGD with Group D, p. 16)
***
Ella: *Opo para ma-base talaga hindi lang yung sa simple lang gud na memorize-memorize and then apply mo na yang parang substitute the values ganyan. Mas better kasi if dyan mo ma-assess talaga if the student really knows kung ano yung gina-solve nya kasi sometimes nagakuha lang tayo ng formulas we don't know ano 'to... yang oh, para sa grade lang o makataas ka ng grade pero malaman mo talaga if na fully grasp nya ang... tawag dyan.. ang topic if i-apply sa practical.*
(Yes, so that you can base not just in simple memorizing and then applying through substituting the values. It's better is you can assess there is the student really knows what he/she is solving because sometimes we just use formulas we do not know what that is... it's like, yes, just for the grade or just to lift the grade up but you can really determine if he/she has fully grasped the.. what do you call it... the topic if applied practical.) (*FGD with Group D, p. 16)
***
Romel: *"Ahmm diba ang purpose man sa assessment kay para makabalo ang student kung ahm... na understand or na-grasp ba niya ang topic? So meaning dili mana sya... dili sya necessary na recorded jud. Pwede man siguro na ang teacher maghatag pud sya'g mga... Ay! Maghatag pud sya'g mga oral recitation, pwede na dili niya i-record para dili consuming or dili effort-consuming.. like for example dapat ang student kay kabalo sya mo-defend sa iyang answer kay through defense, dili man necessary nga big, bigtime defense.. anytime defense lang kay kung ma-defend niya iyang... ang iyahang thought, ang iyang idea or ang iyahang answer itself, so meaning na-grasp jud niya ang topic not only kay nagpatudlo sya sa iyang classmate, "ah mao ni answer sa akong classmate, mao na lang pud ni akong i-answer". So dapat kanang mao to.. kabalo nya... kablo sya mag-explain sa unsa iyahang answer."*
(Ahmm, isn't the purpose of assessment to know if the student, ahm... understands or grasps the topic? So it means that it is not... not necessary that it should be

recorded. Perhaps the teacher can give.. Oh! Give oral recitation, not recorded so that it will not be consuming or not effort-consuming.. like for example the student must know how to defend his/her answer through a defens, not necessarily a big, bigtime defense.. a defense that can be done anytime because if he/she can defend his/her though, idea or his/her answer itself, it means that he/she has truly grasped the topic and because he/she was taught by his/her classmate, "oh this is my classmate's answer, I'll take this as my answer,t oo". So that's it.. he/she knows to explain his/her answer.) ("FGD with Group D, p. 18)

***

(4) *PLA must include peers for self-assessment.* FGD Groups B and C were similar in expressing this way of understanding the process of PLA. Both groups were from a public SHS and the only two groups with physics teachers who were relatively more experienced in teaching secondary physics. Unlike the teachers of the Groups A and D from the private SHS, the teachers of Groups B and C were physics content trainers of the science teachers in their district.

At the center of focal awareness here was the perceived role of peers in assessing oneself on how much has been learned or understood in Physics. This was revealed in the utterances of the students when they expressed that they knew that they have learned a physics concept if they were able to explain it to their peers in their own words and the latter understood them. Discussions, question-and-answer time with peers, comparing answers and explanations with one another particularly when studying and practising word problem-solving, served as an informal way of assessing one's Physics learning. The answers of those who were perceived smart were considered as a standard for correct answers. Hence, students' interaction with peers was understood to be a component for self-assessment that must be included in the process of doing PLA.

This conception mirrored Vygotsky's (1987) social-constructivism learning theory wherein "learning with others has the potential to be substantially more effective than learning alone". This view was supported by Chi, et al (2008) in their investigation into the effect of observing another individual learning. Chi et al (2008) found that tutoring with a peer contributed to more learning than by doing it alone.

The following are selected excerpts of the FGDs of Groups B and C that are deemed to support this.

From FGD Group B:

> Queen: *Mag-agree ako, ay! Mag the same ako ng perception sa kanya na with peers ma'am kasi like ano ahh... haha! my gosh ahmm... maggawa, like kaparehas mig ginabuhat maam ba kanang magbuhat ug problem 'tas compare. Like naa man goy times ma'am na kaparehas mig answer pero different among solution. Like murag there are million ways to kili a cat, hahaha! Murag ing-ana maam, pwede nimo ma-compare, pero ma-assess man nimo ma'am na naka-leam ka if ever na kanang makuha nimo, maabot ka ug kanang the same answer masking different imong solution. Murag ing-ana gud ma'am,. So pwede pud na ang magbuhat sa ano, sa assessment if.. kay kanang kaparehas na ka-peer.*
> (I agree with his perception with peers mam because, ahh.. haha! My gosh, ahmm... we do it in the same way ma'am like we do problems then compare. There are times when we have the same answer but with different solution. It's like there are million ways to kill a cat, hahaha! It's like that ma'am, you can compare answers and assess if you have really learned if you got it ma'am. So it can also be done that the one who does the assessment is your peer.) (*FGD with Group B, p. 28)
>
> ***
>
> Toni: *Sa akoa man kung student-students lang ma'am kanang wala guy teacher kay kuan ang ginabuhat namo ma'am kay panagsa kami ni Queen kay mag kanya-kanya ug solve tapos pagka human ug kanya-kanyang solve kay compare dayun. Kuntahay tama, "ay! ganahan ko ani", pero kung mali siya ma'am kay, "gi unsa nimo na dai?" ana gud ma'am. So, didtoa mas masabtan nimo,"dili man gud dapat i-multiply", ana-ana ba. So murag makasabot ka ma'am ba kung naa poy... kay murag ikaw gud mismo kusa ka na mo-answer kaysa sa sige ra ka'g salig. Kay kung maabot ang time nga ilagyo-lagyo na gud mo ma'am kay dili na nimo kaya, "'dai, tabangi ko!".* (laughs)
> (For me, if it's just among the studens ma'am without a teacher, what I and Queen do is we solve it by ourselves first then after the individual solving we compare. If it's right, "Oh! I like this", but if it is wrong ma'am, "how did you do it girl?", it's like that ma'am. So with that you would understand, "it shouldn't be multiplied", like that. So you would really understand ma'am if there's... because you really answered it by yourself intead of always depending on others. Because when the time comes that you will be placed away from one another and you cannot do it, "girl help me!" (laughs)(*FGD with Group B, p. 28)
>
> ***
>
> Gem: *'Pag feeling nako na tama akong answer i-recheck nako na siya either i-research nako siya sa internet ang answer niya, i-compare nako akoang answer niya. I-compare nako ila Ninna ug ila Danna kay usually kay sila lang man gud ang standards (students laughing). So diha na pag same mo ug answer ma-feel na nako na aah! Hawud na jud ko ug physics, hahaha!"* (students laughing).
> (If I feel that my answer is right, I recheck it by either researching and comparing my answer with the internet. I also compare it with Ninna's and Danna's because usually they are the standards (students laughing). So if my answer is the same with them then I feel that ahh! Finally, I'm now smart in Physics, hahaha!) (*FGD with Group B, p. 28)
>
> ***

From FGD Group C:

> Luke: *Diba ma'am may saying before na you cannot teach what you can't learn or we we don't understand? So, masabi ko ma'am pag na-understand ko ang topic if I can teach it to my classmates or pag ma-apply ko talaga siya ma'am like, kunyari yang sa sports. Kunyari ma'am yang paano man siya nagtakbo, paano yung concept behind kung bakit siya mabilis, bakit siya mabagal, like ganyan ma'am.*
> (Isn't there a saying before ma'am which says that you cannot teach what you cannot learn or we don't understand? So I can say ma'am that I already understand a topic if I can teach it to my classmate or really apply it ma'am like, for example in sports. For example ma'am, how is he running, how is the concept behind his speed, shy is he slow, things like that ma'am.) (*FGD with Group C, p. 19)
> ***

Teachers' and Students' Beliefs About PLA Effectiveness and Efficiency

Research question number 2 dealt with teachers' and students' beliefs about the effectiveness and efficiency of PLA. The data for this part of the analysis were gathered by asking the teachers and students to reflect on their lived experiences of PLA and then describe what they believed characterized an effective and efficient PLA. Moreover, they rated the effectiveness and efficiency of the kind of PLA that they had during the conduct of the study. The rating was based on what the teachers and students believed to be indicators or characteristics of an effective and efficient PLA. These were asked of them for the researcher to explore the context that was behind the expressed beliefs of PLA effectiveness and efficiency. This study agreed with Skott (2015) who described teachers' beliefs as "individual mental constructs, value-laden and subjectively true, being the result of some significant social experiences and having an increased impact over teacher's interpretations and contributions in the context of their teaching". This led the researcher to prompt the teachers and students at the beginning of the interviews and FGDs that there were no right or wrong answers and no judgement for the beliefs that they shared with the researcher.

Teachers' Beliefs About PLA Effectiveness

Table 12 shows the key statements of the teachers' beliefs about effectiveness of PLA. Moreover, the aspects in focal awareness in every expressed belief are also indicated. Following the table is a detailed discussion of each entry.

Table 12 Teachers' Beliefs About PLA Effectiveness

Beliefs on PLA Effectiveness	Teacher(s) Who Expressed the Given Beliefs	Aspects in Focal Awareness
1. PLA is effective when it results to high students' scores.	Teachers A and B (Both teachers had formal education degree and professional teacher's license.)	*Test scores as direct indicator of PLA effectiveness
2. PLA is effective when it has provision for continuous feedback-giving to students.	Teacher A (The youngest and with the least teaching experience)	* Teacher's ability to give feedback as indicator of PLA effectiveness
3.PLA is effective when it is aligned with the existing curriculum guide.	Teacher B (The oldest, with the longest teaching experience, and the only one with an administrative position as STEM Coordinator)	*Adherence to an existing policy as indicator of PLA effectiveness * Test scores as direct indicator of PLA effectiveness
4. PLA is effective when it draws out the actual level of understanding of a student.	Teacher C and D (Teacher C was the only one with a post-graduate level in physics education while Teacher D was the only one with applied physics degree and without a teacher's license.)	*Validity of students' scores as a measure of their actual level of learning in physics *Clarity of PLA in the students' context *Validity of PLA items

(1) *PLA is effective when it results to high students' scores.* In this belief, the aspect in focal awareness was the emphasis on students' test scores as direct indicator of PLA effectiveness. Two out of four teachers (A and B) shared this belief as they pointed out that high scores and grades were direct indicators of student

learning. The only common profile characteristics between the two teachers were their formal undergraduate education degree and professional teacher's license.

This focal point shared both by Teacher A and B also emerged in the earlier discussions on teachers' ways of understanding PLA where scores were perceived as indicator of students' Physics learning and effectiveness of teaching approach or instruction (see discussion on entries 1 and 3 of Table 6). This restressed the beliefs of teachers that scores in written tasks should be considered in evaluating how much the students have learned or need to learn and how he/she can further improve practices in Physics instruction and PLA. As shown in the finding here, this naive view of PLA effectiveness was seen both in the relatively young and seasoned physics teachers and both in private and public SHS. This was also evident in the utterances that centered on considering high students' scores as an indicator that the students understood the lesson through the teachers' strategies.

The following excerpts are cited in support of this finding.

> Teacher A: If the students have understood ma'am as reflected by the grades they have...then it can be considered effective. So if their scores are passing and high, *ibig sabihin, effective imohang assessment. Sa formative naa sya'y score ma'am pero dili sya gina-grade kaayo.* (If the students have understood ma'am as reflected by the grades they have...then it can be considered effective. So if their scores are passing and high, it means that your assessment is effective. The formative assessment also has score ma'am but it's not graded much.) (*Interview with Teacher A, p.33)
>
> ***
>
> Teacher B: Of course if, aah, for example in written work, if majority of the students, aah, majority of the students got perfect or almost perfect, that is an idea indicator *na effective 'yung* assessment. *(... that is an idea indicator that the assessment is effective.)* (*Interview with Teacher B, p.29)
>
> ***

(2) *PLA is effective when it has provision for continuous feedback-giving to students.* One of the four teachers, Teacher A, expressed this kind of belief. Amidst Teacher A being the youngest and least experienced teacher in this study, he still shared a belief about PLA effectiveness that was sophisticated in reference to the social constructivist perspective of PLA. Emerging in the focal awareness of this

belief was teacher's ability to give feedback as indicator of PLA effectiveness. It was also revealed that the practice of informing the students of the status of their physics learning was at the teacher's focal awareness. This finding corresponded to the study of Chi et al (2008) which showed that the kind of feedback that a tutor gives is described as an essential component of formative or informal assessments. Chi et al., (2008) stressed that student learning decreases when feedback-giving consists of only giving students the correct answer. However, learning increases when feedback-giving requires students to give the explanations by themselves (Chi et al, 2008). With respect to the results of this study, it was noted that giving of feedback generally resembled the first type of feedback-giving described by Chi et al (2008). Feedback-giving is also an essential component of a social constructivist paradigm of PLA that is viewed as a sophisticated perspective in this study and several other studies (Gipps, 1999; Birenbaum, 2000; and Kulieke et al, 1990).

In support of this finding, Teacher A's statement is given below.

> Teacher A: *Murag con...continuous na feedback sa student gyud ma'am. Murag kanang, if they take a formative na assessment...the teacher must be giving, aah, right away the feedback, kay kung... most cases kasi ma'am, we tend to not give it on time, kasi murag so many things to do. You know...daghan-daghan pud ang volume sa check-anan ba. So in that case, important na mahatagan og feedback dayon, para makabalo pud ang bata.*
> (Perhaps con... it's really continuous feedback to the students ma'am. It's like if they take a formative assessment... the teacher must be giving, aah, right away the feedback, because if... because in most cases ma'am, we tend to not give it on time, because of so many things to do. You know... the volume of papers to check is also high. So in that case, it is important to give immediate feedback to the students so that they would also know.) (*Interview with Teacher B, p.29)
> ***

(3) *PLA is effective when it is aligned with the existing curriculum guide.* Teacher B described his beliefs about PLA effectiveness in this way. The profile characteristics that were unique only to Teacher B were as follows: engineering background in addition to his education degree and administrative position as STEM coordinator in his school.

One of the aspects in focal awareness in this belief about PLA effectiveness was the emphasis on adherence to an existing policy as indicator of PLA effectiveness. The curriculum guide for General Physics 1 (www.deped.gov.ph) that was given by the government was the existing policy that was central here. This was revealed in the Teacher B's belief that the presence of all of the summative components (i.e.written tasks, performance tasks and quarterly exams; DepEd Order Number 8, s. 2015) signified a kind of PLA that was aligned with the mandated learning guide. This consequently, was believed to be an indicator of having an effective PLA. This appeared to be a re-emerging focal point as this was revealed three times in the teachers' utterances in the earlier sub-sections (see analysis of entries 1 and 4 of Table 6; and entry 2 of Table 8).

Another aspect in focal awareness was the emphasis on test scores as direct indicator of PLA effectiveness. As revealed by the utterances of Teacher B, high students' scores in the components of PLA indicated that the PLA given was good and hence, deemed effective. Given below are statements of Teacher B in support of the finding presented in this part of the study.

> Teacher B: Another is, for performance task . if... if... aah, if the students, if the output of the students, of course, follow the rubrics, *ibig sabihin nasabtan nila* (it means that they have undertood it) and of course in quarterly exam. Of course if they got aah, high score, therefore, that is aah, an indicator that the assessment is good. If those things are present there, it means that that assessment is aligned with the objectives, competencies and educational standards based on the learning guide by DepEd." (*Interview with Teacher B, p. 28)
> ***

(4) *PLA is effective when it draws out the actual level of understanding of a student.* Two of the four teachers (C and D) shared this belief. Teacher C was the only one who reached the post-graduate level in physics education while Teacher D was the only one who had Applied Physics degree and research analyst experience in the industry. Central in the focal awareness of this belief about PLA effectiveness

were the following: validity of students' scores as a measure of their actual level of learning in Physics; clarity of PLA in the students' context; and validity of PLA coverage with respect to what has been actually taught. Teachers C and D expressed belief that for PLA to be effective, students' scores must be a true representative of their actual level of Physics understanding. This ran counter to some students' belief that PLA scores did not necessarily represent the actual level of Physics understanding. A high score does not always indicate that a student has actually learned, nor does a low score be taken as indicative of low level of learning.

Teachers C and D both expressed belief that to ensure the effectiveness of PLA, a given PLA item must be valid. They differed, however, on their description of validity. For Teacher C, PLA that only covered the assessment of comeptencies that were and developed passed the test of validity. For Teacher D, on the other hand, validity was believed to include clarity based on the students' context, specially the role of language used.

The selected excerpts of teachers' interviews are given below to support the finding presented in this part of the study.

> Teacher C: Ahh! It should be valid. The task or even the items, if it's a questionare. Uhh, it should be valid with what you have taught. I mean at least you have prepared them or give a little experience about the concept, even just concept of the content of the questions. Ahh...So, you should not give an assessment *na wala nimu gi-tudlo* (...you should not give an assessment that you did not teach.) That would be an injustice to my students.
> (*Interview with Teacher C, p. 18)
> ***
> Teacher D: *Siguro ma'am assessment tool that could draw out the real understanding of the learner. Kasi may time na like sa problem solving sa jargon sya nalito pero wala lang kaayo niya nasbtan ang English niya. There's a language barrier ... language barrier, dili man ta hanas ana bitaw, so kana makdraw out jud sya kay basin nalibog lang sya ana ba." —"Effective sya ma'am if same ra yang answer magdraw out jud iyang understanding na ing-ana. So what she understands sa lecture, sa uban pang mga sources, sa assessment tool makita jud na niya. So bo-ut pasabot, ang usa ka effective physics learning assessment, naga-represent jud na most likely sa pagsabot sa usa ka bata.--- Kay naa may times na there's certain tool na ang gihakuha lang niya na technique kini lang, that's not the total representation of learners' understanding... possibly gamay ang score sa bata pero in reality nakasabot mana sya kay giexpalin niya sa lain, nakasabot man ang lain na bata.. pwede pud na dako kayo sya ug score unya wala diay saya kasabot noh? Meaning dili to sya effective na physics learning assessment, murag ana...*

(Perhaps ma'am assessment tool that could draw out the real understanding of the learner. Because there is a time like in problem solving, it's in the jargon where he/she gets confused and does not understand the English much. There's a language barrier... language barrier, because we are not fluent, so it (assessment) must really draw out because the students might just be confused. So what the student understands in the lecture, and other sources, it can really be seen in the assessment tool. In other words, an effective physics learning assessment is something that really represents the most likely understanding of a student. Because there are times that a certain tool only focuses on a technique, that's not the total representation of learners' understanding... possibly a student's score while in reality he/she has understood because he/she is able to explain and let others understand... it can also be that a student gets a high score even without understanding, right? It means that that physics learning assessment is not effective, it's something like that.) (*Interview with Teacher D, p. 18)

***

The teachers were asked to rate (one being the lowest and ten the highest) the effectiveness of their implemented PLA using their beliefs as indicators. The average of the teachers' ratings was 6.7 out of 10. Teachers were found to base their self-ratings on comparing the difference between their set ideal effective PLA and the actual situation that they were in. Teacher A shared that he was not able to give immediate feedback to his students regarding their test scores due to the bulk of papers to check. This resonated with some studies which argued that feedback practices are weak in classrooms (Black and Wiliam, 1998; Black and Wiliam, 2009; Wiliam, 2011). However, he believed that he was doing his best, hence, gave a 7 out of 10 self-rating.

Teacher B who believed that an effective PLA stressed the presence of all the summative components, with more emphasis on giving performance tasks, gave a self-rating of 6 out 10 on his PLA effectiveness. He reiterated the failure to focus on what he believed as the best assessment, the performance tasks. Constraints such as the breadth of learning competencies that he believed must be taught and the limited laboratory equipment were raised as factors that hindered the teacher from realizing his ideal effective PLA.

On the other hand, Teacher C believed that the mathematical skills needed in solving the problems given in PLA were not reviewed and re-taught. This made his

PLA less effective. Teacher C did not give any rating. Finally, Teacher D rated his PLA effectiveness at 7 out of 10 because of the disparity between what the students expressed as their level of understanding and the scores that they got in the end. This was believed to indicate that the students' scores were not valid representation of their true level of Physics understanding, hence, an indicator of a relatively ineffective PLA.

The following excerpts from teachers' interviews support this finding.

> Teacher A: *Seven ma'am kay... umm... seven... there are lapses sometimes, ma'am. Dili nako mapa—ma-check jud dayon kay daghan man sila, ma'am. Unya... di pud ko maka-ingon na super-super bagsak, kay – na—ginabuhat baya nako akong part as a teacher. So, in the middle, sa ano ma'am, seven. Above na lang sa average.*
> (Seven ma'am because.. umm.. seven... there are lapses sometimes ma'am. I cannot do the checking immediately because the students are many ma'am. Then... I cannot also say that it's really that failed, because I am also doing my part as a teacher. SO, in the middle ma'am, seven. It's just above the average) (*Interview with teacher C, p. 27)
> ***
> Teacher B: In my own belief, I think, six. Aaah, it is because aah...it is because aah, right now... I... *yung...* because *sa daming* learning competencies...*yu...yun talaga yung problema. Sa daming learning competencies na dapat i-cover, aah, yung pagbibigay... for me kasi, the best assessment is giving performance task. That is the best assessment. But for, aah... pero right now, sa daming learning competencies na kailangan i-kuan, mate-tempt yung teacher na gagamit ng lecture method. So, ang nangyari most of the assessment, aah... doon ang... most of the assessment ay doon kukuha sa written... written talaga. Kaya nga sabi ko, aah, yun yung problema. And another problem, aah... congestion of learning competencies to teach, and then of course, our laboratory equipment.*
> (In my own belief, I think, six. Aaah, it is because aah...it is because aah, right now... I... the.. because of the many learning competencies...that...that is really the problem. With the number of learning competencies that should be covered, aah, the giving... because for me, the best assessment is giving performance task. That is the best assessment. But for, aah... but right now, with the number of learning competencies that you need to, the teacher will be tempted to use the lecture method. So, what happens most of the assessment, aah... most of the assessment is on the written... really on written. That is why I say that that is the problem. And another problem, aah... congestion of learning competencies to teach, and then of course, our laboratory equipment.)(*Interview with teacher C, p. 27
> ***
> Teacher C: Yahh! Not perfect because, sometimes the- it's the Halliday, Resnick noh? If the student won't only just copy for the sake of having uhh... an output. If they will have to analyze and try to answer the problem sets, it would gonna require them in fact not just the Physics concepts that I taught them. They would gonna apply and remember their calculus and their algebra and their trigo. So the problem with that, all of those skill, *hindi ko na sya minsan natuturo ahh... kasi nga fifty minutes lang. So good na matatapos ako nang two problems na example* (I cannot teach these to them anymore, ahh.. because we only have fifty minutes. It is already good if I can finish two example problems). In fact what we are doing, we are analyzing the sample problem all ready on the Halliday and Resnick book because if we keep on calculating on the board, it would gonna consume our, so what we usually do, it's

good that I'm using the Halliday and Resnick. That they have this sample exerci.. sample problem and there is a corresponding additional task/exercise and then there is an answer key so the exercise there is almost similar with the problem given with the example. So, you cannot perform the exercise if you cannot or if you fail to analyze the solutions on the first proceeding in example. (*Interview with Teacher C, p. 27)

***

Teacher D: *Seven sya ma'am kay sometimes in my perspective, ok sya kay makuha man nimo ang concept, kay makasolve man ka. Pero sa mga student, they understand daw the concept pero pag abot sa problem, dili na sila kasabot. Pero in my opinion kana man gud ilaha ginasulti, I think they are trying to memorize the process kay tagaan nimo sila ug new na problem dili naman to mao ang process.*
(It's seven ma'am because sometimes in my perspective it's okay, it's okay because you (the teacher) knows the concept, because you can solve it. But the students, they say they already understand the concept but when it comes to the problem, they cannot understand it anymore. But in my opinion, that's what they really say, I think they are trying to memorize the process because if you give them another new problem, the process isn't right anymore.) (*Interview with Teacher D, p. 19)

***

At this point, the four emerging teachers' beliefs on PLA effectiveness were discussed. It was revealed in the analysis that some of the teachers' beliefs were centered on their choice of adhering to a certain existing policy. Students' PLA scores were also believed to be indicative of the level of their Physics understanding and consequently of the level of PLA effectiveness. These were noted as re-emerging, hence, taken as being central to their understanding and beliefs.

Teachers' Beliefs About PLA Efficiency

The next part of this study presented the analysis for the teachers' beliefs on PLA efficiency. The teachers were not given any prior description of the word 'efficiency' during the interview. This was done to explore their own understanding of it and thereby express their personal beliefs about what makes an efficient PLA. Table 13 shows the captured teachers' beliefs and the emerging aspects in focal awareness. Following this table are the discussions of each belief.

Table 13 Teachers' Beliefs About PLA Efficiency

Beliefs on PLA Efficiency	Teacher(s) Who Expressed the Given Beliefs	Aspects in Focal Awareness
1. PLA is efficient when the students' scores are high.	Teacher A (The youngest and on his second year of teaching)	*Teacher's effort in giving formative assessments *Test scores as direct indicator of PLA efficiency
2. PLA is efficient when the rate of teaching the required learning competencies is high.	Teacher B (The oldest in age and teaching experience; with engineering background; and handled an administrative position)	*Rate of covering required learning competencies as indicator of PLA efficiency *Teaching strategy as factor for PLA efficiency *Student scores as basis for adjusting the rate of teaching the learning competencies
3. PLA effectiveness supersedes PLA efficiency in terms of the level of competencies that it assesses.	Teacher D (The only one without a professional teacher's license but an industry experience as applied physics research analyst)	*Perceived hierarchical relationship between PLA efficiency and effectiveness
4. PLA is efficient when it is time-saving.	Teacher C (The one with the post-graduate level in physics education)	*number of competencies and skills that can be covered in PLA as indicator of efficiency

(1) *PLA is efficient when the students' scores turn out high*. Two aspects emerged as being central to this belief. First was teacher's effort in giving formative assessments and second, the emphasis on test scores as direct indicator of PLA efficiency. Only Teacher A explicitly expressed this belief with much stress on comparing teacher's level of provision of formative assessments as the input and students' scores as the output. Going back to his profile context, Teacher A was the youngest and did not have any other training background except his education undergraduate degree. Having this context, it was revealed that Teacher A solely based his belief of PLA efficiency on his understanding of the physical meaning of efficiency. However, it was evident in the teacher's utterances that he struggled in

expressing his belief at first. The researcher had to give him time to reflect and gather his thoughts, then he was able to articulate his beliefs. Although the second aspect in focal awareness was not unique to Teacher A, his belief of PLA efficiency as indicated by the input of teacher's effort in the formative assessments and the resulting students' PLA scores as the output was distinct. In this kind of belief, it was revealed that when a teacher's formative input effort resulted to high students' scores, the PLA given was believed to be efficient and otherwise if the latter turned out to be low.

Given below is Teacher's A articulation of his belief on PLA efficiency in support to the finding discussed in this part of the study.

> Teacher A: As a teacher ma'am, efficient *ang assessment... kung daghan pasa so ang ... ahmm, the... ahmm... kung... kung effort nimo as a teacher ma'am mag-matter pud. Kung mag-effort ka for your students, dapat mag-reflect pud sya sa effort sa bata. So kung gi-input... tagaan nimo og more assessment, formative ang bata, dapat katong imong effort na ginahatag sa bata, mag-reflect pud sya sa ilahang scores. — Efficiency, input nimo... ang pagtudlo nako.. katong akong scaffold sa ilaha sa formative.. sa assessment.. ang output... unya kung mu-reflect sya nga... na... maayo ang performance sa mga bata sa summative, ibig sabihin...efficient ang assessment. Meaning, murag wala'y na-waste.. Murag ana.* (laughs)
> (As a teacher ma'am, an assessment is efficient... if many students pass it so ahmm..the ahmm. The teacher's effort also matters. If you exert an effort for your students, it should also be reflected on the students' effort. So if the input...if you give more assessment, formative to the students, the effort that you give for the students must also be reflected on their scores.— Efficiency, your input... my teaching.. the scaffold that I do during their formative.. in the assessment... the output... if it is reflected in...in the performance of the students in the summative, it means... the assessment is efficient. Meaning, nothing is wasted. Something like that. (laughs)(*Interview with teacher A, p. 36-37)
> ***
>
> Teacher A: Seven ma'am... *kuan, nagahatag man pud siguro ko'g input ma'am sa bata na unsaon sya. Mga seatwork, assessments... mga... pero... thirty percent, or ingon ana ma'am, kay murag dili jud gud mag-reflect sa bata ang scores na akoang ginahatag sa ilaha. So seventy per—percent efficient siguro...* when it comes to efficiency.
> (Seven ma'am... because, I think I have also given input to the students ma'am on how to do it. The seatwork, assessment... the.. but thirty percent, or something like that ma'am, because the scores that I give to the students do not really reflect it.) (*Interview with Teacher A, p. 38, when asked to rate the efficiency of the PLA that he implements)
> ***

(2) *PLA is efficient when the rate of covering the required learning competencies is high.* There were four aspects in focal awareness that were

identified here. These were: rate of covering the required learning competencies as indicator of PLA efficiency; adherence to an existing policy; students' scores as basis for adjusting the rate of teaching the learning competencies; and teaching strategy as factor for PLA efficiency.

Teacher B expressed this kind of belief where PLA efficiency was compared to the physical meaning of efficiency as understood by the teacher. Based on the utterances of Teacher B, being efficient was understood as doing a certain work within a shorter time. Putting this in the context of doing PLA, Teacher B believed in the inter-relationship among effective teaching strategies, students' PLA scores and PLA efficiency. Good and effective teaching strategies were believed as those that yielded high test scores and consequently a faster pace in shifting from one topic to another. If majority of the class got average or more than average scores, it indicated that the teacher could proceed to the teaching of another learning competencies. Less or no re-teaching at all was seen as time-saving. In other words, a high rate of covering the topics was indicative of an efficient PLA.

A teacher's deliberate choice of adhering to an imposed policy motivated him to implement an efficient PLA. As mentioned in the earlier parts of this chapter, Teacher B was the only teacher in this study who was concurrently the STEM coordinator in their school. He was also the lone teacher who had engineering background aside from his education training. The understanding and belief that it was the teachers' obligation to cover and teach all of the learning competencies in the curriculum guide was seen as a re-emerging aspect in focal awareness. Moreover, students' scores in the summative PLA components was understood and believed to be a direct representation of the students' level of Physics learning and the effectiveness of the teaching strategies used.

Given below are the excerpts from the interview with Teacher B in support to the findings discussed earlier.

> Teacher B: Ahh, identifying the appropriate indicators of learning. So, for example, if you have an assessment *tapos* majority of them ahh, got the correct score, so, you need...since majority of them *medyo nakuha nun yung... makuha nayun... medyo... for example majority sa kanila malalaki... ahh matatas yung scores, so that's aah, an indicator na you need to...to sh—to shift to another topic na. So... kasi, congested naman yung ano natin...congested yung mga topics sa... sa Physics as of this time...so, dapat talaga merong assessment. So in the...in your assessment, if for example nag-conduct ng assessment, majority sa kanila nakakuha...hindi ka na kailangan...'wag nang patagalin pa yung topic na yun.* Shift to another topic.
> (Ahh, identifying the appropriate indicators of learning. So, for example, if you have an assessment and majority of them ahh, got the correct score, so you need – since majority of them got the... got the.. for example if majority of them got big... ahh high scores, so that's an indicator that you need to shift to another topic already. So... since it is congested.. the topics are congested in Physics as of this time... so there has to be assessment. So in the.. in your assessment, if for example you conducted an assessment and majority of them got... there's no need... do not stay in that topic for long. Shift to another topic.) (*Interview with Teacher B, p. 29)
> ***
> Teacher B: *So... kung paspas ang pag-shift nimo from one topic to the other, efficient imong assessment kay wala ka naglangan. You are doing a work in a less time. Mura gihapon'g sa Physics ba. So ibig sabihin, kung na-stop ka sa isa ka-learning competency kay imong gina-reteach, dili efficient kay nag-sige man ka'g balik-balik.— So when we say an—aah, efficiency, of course kailangan talaga ng teaching strat. Dun papasok yung teaching strategy, kasi, by doing so, if your teaching strategy is very good, then, that will make the assessment efficient. Magkasabay kasi yung ano, magkasabay kasi yung aah... they are inter-related, the assessment and teaching strategy. Yun. Mag-interrelated talaga ang dalawang yan.*
> (So... if you are fast in shifting from one topic to another, your assessment is efficiebt because you are not delaying. You are doing a work in a less time. It's the same in Physics. So meaning to say, if you are stuck in one learning competency because you re-teach it, it is not efficient because you keep on repeating. — So when we say an—aah, efficiency, of course teaching strat is needed. That is where teaching strategy comes in, because by doing so, if your teaching strategy is very good, then, that will make the assessment efficient. They go together, they are interrelated, the assessment and teaching strategy. That's it. The two are really interrelated.) (*Interview with teacher B, p. 30)
> ***
> Teacher B: In my own belief, I think, six (self-rating for PLA efficiency). Aaah, it is because aah...it is because aah, right now... I... *yung... because sa daming learning competencies Yun talaga yung problema. Sa daming learning competencies na dapat i-cover, aah, yung pagbibigay... for me kasi, the best assessment is giving performance task. That is the best assessment. But for, aah... pero right now, sa daming learning competencies na kailangan kuan... mate-tempt yung teacher na gagamit ng lecture method. so, ang nangyari... most of the assessment, aah, doon ang—most of the assessment ay doon kukuha sa written... written talaga. Kaya nga sabi ko, aah, yun yung problema.* And another problem, aah... congestion of learning competencies to teach, and then of course, our laboratory equipment.
> (In my own belief, I think, six (self-rating for PLA efficiency). Aaah, it is because aah...it is because aah, right now... I...the.. because of the many learning competencies. That is really the problem. Because of the many learning competencies that need to be covered, aah, the giving of... because for me, the best assessment is giving performance task. That is the best assessment. But for, aah.. but right now, with the many learning competencies that need to... the teacher is tempted to use the lecture method. So, what happens... most of the assessment... aah.. most of the assessment is from the written... it's really written. That's why I say

that that is the problem. And another problem, aah... congestion of learning competencies to teach, and then of course, our laboratory equipment.) (*Interview with teacher B, p. 30)

***

(3) *PLA effectiveness supersedes PLA efficiency in terms of the level of assessed competencies.* The aspect in focal awareness here was the perceived hierarchical relationship between PLA efficiency and effectiveness with respect to the level of assessed competencies that these assess. Only one out of the four teachers, Teacher D, anchored his belief on how he understood its physical meaning. He was also the sole teacher in this study which had no formal education degree nor a professional teacher's license and plans of obtaining in the next three years. He explained that efficiency would be high if a certain input yielded a high output. At the beginning of his sharing, Teacher D appeared confused and equated efficiency with effectiveness. However, after further thought, he clarified that efficiency was somewhat at the lower level than effectiveness.

Teacher D believed that an efficient PLA was one that assessed students' analytical problem-solving skills. This would be usually as written tasks like problem sets. On the other hand, an effective PLA superseded the efficient one because it also covered practical and investigative science process skills. He believed that effective PLA should be done through laboratory experiments which integrated real-life and practical applications of learned concepts in the class. This implied that the level of thinking skills that an efficient PLA assesses are relatively lower than those assessed by an effective PLA. Teacher D's belief further implied that an effective PLA is necessarily efficient but an efficient PLA is not necessarily effective. Teacher D also emphasized that a PLA that would require students to apply and integrate many Physics concepts and skills could be considered as efficient and effective. Based on this belief, Teacher D rated the efficiency of his PLA as nine out of ten because he believed that he always ensured to include problems that could assess several competencies and skills. Hence, he believed that his PLA was relatively efficient in this context.

In support of this part of the finding, excerpts from the interview with Teacher D are given below.

> Teacher D: *Efficient sya ma'am kay kung for example ma-solve nimo ang problem, nakasabot sya, naperfect siya. That means nasabtan niya from that solving. So katong gihatag nimo sa assessment tool, sa quiz efficient to sya. Moingon ka na effective, sa ako lang pagsabot ma'am, murag maaply jud to nimo sya ma'am ,kay naa man uban kabalo jud mag-solve pero disconnect sa iyang thinking ug reality. Dili pa niya maapply ang reality. — Maano nimo ma'am na effective sya, mas effective to kay ma-relive man ang concept to reality...so sa efficiency imuha lang tan-awn kay... is katong fundamental na competencies like maka-solve sya ug problem, pero kung part pa sa imohang quiz , sa any assessment ma-drawout nimo sa mga bata na kaya nila maaply sa practical,effective na pud sya.*
> (It is efficient ma'am if for example, you are able to solve a problem, he/she understood it, he/she got perfect in it. That means he/she understood it from that solving. So what you gave in that assessment tool, in the quiz, that is efficient. You can say that it is effective, in my own understanding ma'am, if you can really apply it ma'am, because there are others who know how to solve but there is still a disconnect between their thinking and reality. He/she cannot apply it in reality. — You can say that it is effective ma'am, it's more effective because it can relive the concept to reality... so in efficiency, you just look at the... at the fundamental competencies like solving aproblem, but if part of your quiz, in any assessment, you can draw out from the students they ability to apply it is practical, then it is also effective.) (*Interview with Teacher D, p. 20-21)
> ***
> Teacher D: *Seven ko ma'am...(pauses)... Nine siguro, kay kung ako pud ma'am kung ako sad ma'am mangita ug problem daghan jud sya ug maigo.. na dili lang kana lang. Dili pud ko ganahn anang direct na plug in, plug in. Kanang mo-drawout pa sya ug laing concepts ma'am. So kato ma'am... pag efficiency, daghan ka ug ma cover nga skills sa mga bata. Meaning naa kay gihatag na isa ka problem pero efficient sya ky daghan sya ug maaply na skills in solving that problem. Dili ko gusto anang plug in, plug in lang na mga problems mam kay algebra lang man na sila nga walay physics.*
> (It's seven for me ma'am... (pauses)... Perhaps nine, because when I look for problems, I always make sure that it hits many instead of just one. I also do not like a direct plug in, plug in. It has to be drawing out some other concepts ma'am. So, that's it ma'am... when it comes to efficiency, it covers several skills of the students. Meaning to say, you give a problem and it is efficient if it requires several skills to be applied. I do not prefer the plug-in problems because it is just algebra and no physics.) (*Interview with Teacher D, p. 20-21)

(4) *PLA is efficient when it is time-saving.* Among the four teachers, Teacher C explicitly expressed this belief about PLA efficiency. As noted earlier, Teacher C was the only one who was taking up a doctorate in physics education during the conduct of this study. It emerged that Teacher C put much emphasis on this aspect

of time maximization as indicator of PLA efficiency. He believed that utilizing readily-available physics reference books as a source for PLA written assessments saved him and the class significant length of time. Teacher C reiterated that he was using a college-level foreign reference book available in the internet without any charge. There was no required textbook so teachers could use any appropriate reference books. Moreover, students could use their smart phones or other electronic gadgets in class to browse their electronic book or e-book. Example problems in their e-book were discussed by the teacher and the enrichment exercises were used as formative seatwork exercises. Using readily-available PLA resources such as a free e-book, with the available solutions manual, checking of papers was done quicker hence, saved the teacher much time.

Following is an account of the researcher's observation of Teacher C's class (FGD Group C) while using the e-book. Teacher C gave a short lecture for about less than ten minutes on the topic, Newton's Law of Universal Gravitation. Then he grouped the class into three to four members each. Each group was assigned a section in their e-book to read, discuss and make a concept map. After this, three groups were chosen through drawing of lots to report their output. In the group reporting, teacher added reinforcement through correcting misconceptions and emphasizing important ideas. Students were given time to revise their concept maps and to submit them next meeting. All of these activities were accomplished by the class and the teacher within their fifty-minute session. The students were also observed to work with their groupmates and delivered what was asked of them.

Teacher C expressed that he tried a PLA before that required the students to do derivations of formula or relationships. Unfortunately, results showed that the students were not prepared for such kind of PLA. When asked by the researcher if there were prior preparations given to the students in line with that kind of PLA, Teacher C replied affirmative. He believed that it was not very efficient because it cost them several sessions but covered only very few competencies and topics. Adherence to an existing policy re-emerged as a driving force in this kind of belief as Teacher C went back to mentioning the curriculum guide as containing the ideal set of competencies that the students must be abe to develop. He emphasized that the listed learning competencies in the said document could only be taught in an ideal situation where students are ready and resources such as time and equipment are available. Teacher C echoed his dilemma of choosing between what he believed was ideal and what he could actually do.

Finally, Teacher C did not give an actual rating of the efficiency of this implemented PLA, but expressed the belief that his PLA was efficient because of the time saved in using the available PLA resources.

The following excerpts from the interview with Teacher C are given below in support of this part of the findings.

> Teacher C: *Efficient lang man siya ibigay because it's there already. So, yung mga formative assessment ko, na share ko na nga. May example problem and then I just let them do the follow up exercise. And then at least they would be, it would gonna have their... boost their confidence because they could check if they are doing it correctly. Parang may instant feedback na kasi, may answer na doon. You are expected to come up with an answer. However, I really...before I tried to give them para bang kung Halliday-Resnick, para bang derivation. But it's quite frustrating so ini-iwasan ko na muna yun.* They are not prepared.
> (It is efficient to give simply because it's already there. So, I have shared my formative assessment. There is an example problem and then I just let them do the follow up exercise. And then at least they would be, it would gonna have their... boost their confidence because they could check if they are doing it correctly. It's like there is an instant feedback, because the answer is already there. You are expected to come up with an answer. However, I really...I tried giving them something like a Halliday-Resnick before, something like a derivation. But it was quite frustrating so I do away with it as of now. They are not prepared.)(*Interview with teacher C, p. 30)
>
> ***
>
> Teacher C: It's more of push and pull? Ahh... you want to have this kind of activity but probably the students are not prepared, and the resources are not prepared. You have limited time so you have to... *anong tawag niyan? Anong term yan? Forgot the term. Yun bang if I don't... hindi appropriate yung remedy eh. You have to compromise. Comprise I think is the key here... we keep on compromising both the depth and the development of scientific skills. One, because of the very limited resources uhh and the enabling skills of the students... because if you go back, the*

only way uhh... if you want to have this because this is the ideal setup for the CG (curriculum guide) based on for general physics. 'Eto dapat ang na...naperform ng studyante. But this is where we are now, they lag behind.. they.. I notice wala silang yung enabling skills ba. Prerequisite skills to perform the task. Ahh.. so the only way to for you to at least approach or nearly approaching to that objective is for them to have a remedial class outside of your regular time. The problem with this kids they... all of the other subject loaded sila ehh.. Pag yan may mga...lahat yan mag re-require ng ano so...may performance tasks lahat..lahat ng subjects. So yun lang... uhh... kung ano yung based on my professional judgment, what I think is necessary for them.. if the necessary skills that they have to develop at least kahit yung basic lang when they proceed to college.

(It's more of push and pull? Ahh... you want to have this kind of activity but probably the students are not prepared, and the resources are not prepared. You have limited time so you have to... what do you call it? What's the term? Forgot the term. It's like, if I don't, the remedy is not appropriate. You have to compromise. Comprise I think is the key here... we keep on compromising both the depth and the development of scientific skills. One, because of the very limited resources uhh and the enabling skills of the students... because if you go back, the only way uhh... if you want to have this because this is the ideal setup for the CG (curriculum guide) based on for general physics. This is what it should be... what the students can perform. But this is where we are now, they lag behind.. they.. I notice that they do not have the enabling skills. Prerequisite skills to perform the task. Ahh.. so the only way to for you to at least approach or nearly approaching to that objective is for them to have a remedial class outside of your regular time. The problem with this kids they... they are loaded with all of the other subject... All of those require... they have performance tasks.. all of those subjects.. So that's it... uhh... what I think is necessary for them based on my professional judgment.. if the necessary skills that they have to develop at least even just the basic when they proceed to college.) (*Interview with Teacher C, p. 32)

***

Students' Beliefs About PLA Effectiveness

There were four different beliefs on PLA effectiveness that emerged from the students' sharing. When asked to rate the effectiveness of the PLA that they were experiencing, students gave an average of 5.7 out of 10 based on their beliefs, which was lower than the teachers' average rating of 6.8. Table 14 shows the key statements on the students' beliefs on PLA effectiveness.

Table 14 Students' Beliefs About PLA Effectiveness

Beliefs on PLA Effectiveness	FGD Group(s) Which Expressed the Given Beliefs	Aspects in Focal Awareness
1.PLA is effective when both teacher and students learn from it.	Group A (With the greatest number of males (5 out of 8); all liked learning about physics; and half of the group were JHS awardees)	*Clarity of PLA results that lead to the identification of the students' strong and weak parts *Usage of PLA results for students and teacher improvement
2. PLA is effective when it involves active learning.	Groups C and D (The two groups with the most number of females and JHS awardees)	*Application in practical experiences *Close relationship among instruction, assessment and learning
3. PLA is effective when it is motivating.	Groups B and D (The only two groups with physics teachers with applied science background)	*Motivating effect on students as indicator of effectivity *Independence as indicator of motivating PLA *Variety of PLA forms * Close relationship among instruction, assessment and learning
4. PLA is effective when it encourages students toward peer collaboration.	Groups B and C (Both from a public SHS whose physics teachers were relatively older in age and more experienced in teaching)	*Peer collaboration as effective form of PLA * Close relationship among instruction, assessment and learning

(1) *PLA is effective when both teacher and students learn from it.* This belief emerged in the FGD with Group A. This group from a private SHS had the most number of males among the four FGD groups in this study. This was also under the youngest and least experienced teacher, Teacher A. The aspects in focal awareness here were the clarity of PLA results that led to the identification of the students' strengths and weaknesses and usage of PLA results for student and teacher improvement. The effectiveness of PLA was believed to depend on how teachers

and students utilized students' PLA scores for improvement. For the students, they could minimize commiting the same mistakes in future PLA. For the teachers, the areas in a given PLA where several students made incorrect responses called for an improved manner of teaching for better student understanding. Hence, this belief implied that PLA is effective when teacher and students use the scores to improve learning and teaching.

The students likewise expressed that accuracy of PLA was an indicator of effectiveness. Accuracy was believed to be dependent on the extent to which students' scores could be considered as a measure of the students' actual level of Physics understanding. This further implied that when accuracy was ensured, the students' PLA scores then could be used both by the teacher and the students for their improvement.

The following excerpts taken from FGD Group A are given in support to the findings presented in this part.

> Eman: For me am I believe that physics learning assessment is effective when a student and the teacher learn from the assessment itself. Aahh.. which part they got wrong.. for the student, they got wrong, they would be able to apply... they would be able to correct their mistakes in the next assessment. And for teachers, they will learn what the students, the results of the student's assessment and they will be able to reiterate and rephrase. *Ahh.. parang ipresent nila ulit ang* concepts, not really in an easier way but in a way that the students will understand as to have them in their next assessment. (Ahh... it's like they present the concepts again, not really in an easier way but in a way that the students will understand as to have them in their next assessment.) (*FGD with Group A, p. 18)
>
> ***
>
> Phil: I think ahm... an effective ahh physics learning assessment is both accurate and precise ma'am. Accurate in the sense that both the teacher and the student can agree upon the results of the assessment that yes as a student, I think that this part, this aspect of the things I learn are very weak or very strong and same as a teacher that am, basing the assessment I can say that, yes the student has lapses in this particular area of physics. (*FGD with Group A, p. 19)
>
> ***
>
> Kea: *Aah mga siguro nasa six or seven lang ...napansin ko kasi kunwari may may magtanong sa akin na classmate ko na parang paano magsolve ng ganito, ganyan-ganyan, kay magets man nila pero bakit parang pag-abot ng exam, kay parang hindi good... or parang feel or murag quiz kay parang hindi ganon ka-good ang kanyang giperform ba.. pero 'pag makita mo sya mag-solve, mag-practice, mag-study kay effective man masyado ang pagturo ky maintindihan mo man. Maintindihan nya man pero feel ko lang yang makulbaan lang sya 'pag exams, parang ganyan lang ma'am.* (Aah.. maybe it's at six or seven only...Because I notice that when a classmate asks me how to solve something, they get it but when it come to the exam, it's not good...

or in a quiz, his performance is not that good... but you can see him when he solves, practices or studies, the teaching is effective because you can understand it. You can really understand it but I feel that he is just nervous in the exams, it's like that ma'am.) (*FGD with Group A, p. 19) --- (as she gives the reason behind her PLA effectiveness rating)
***

2) *PLA is effective when it involves active learning.* This belief about PLA effectiveness was expressed by Groups C and D. With respect to their profile context, these two groups both had more females than males and the most number of JHS awardees. The aspect in focal awareness here was the component of PLA that enabled students to put their Physics learning into practical applications, thereby leading them to an appreciation and understanding of Physics. This characteristic of PLA, in addition to effective teaching approach, was believed to be more effective than the usual word problem-solving and fast-paced traditional lectures. Re-emerging in this belief was the intertwined connections among teaching strategy that promoted active learning among students (Slisko, 2017), effective PLA and students' Physics learning. This students' preference for a more active and hands-on practical applications as indicators of effective Physics teaching and assessment was noted to be consistently re-emerging in the students' utterances.

Moreover, the findings here revealed that the students believed that they learned better when they had actual participation in the construction of their understanding rather then being mere spectators (Vygotsky, 1989; Chi et al 2008). This was also parallel with the findings of Sardareha and Saad (2012) which revealed that "students learn better when they actively participate in the learning process, reflect on their activities and set their own targets and assessment criteria".

The following are excerpts from the students' FGDs. These are given in support of the findings presented in this part.

From FGD Group C:

Luke: For me, *mag-start muna ang teachers for giving the concepts itself then after that give siya ng real-life situation problem and after that we will visualize then apply it in real life or mag lab, for example gravity or something like that. First, the teacher gave the problem or the concept behind it and after that may times siguro na mag lab kami we will apply the concepts of gravity to ourselves or to other objects, like parang ganyan po.*
(For me, the teachers can start giving the concepts itself then after that he/she gives a real-life situation problem and after that we will visualize then apply it in real life or do a lab, for example gravity or something like that. First, the teacher gave the problem or the concept behind it for many times and after that we do a lab where we will apply the concepts of gravity to ourselves or to other objects, something like that.)
(*FGD with Group C, p. 29)
***

Ninna: *Sa akoa ma'am kay ang effective learning assessment kay let's say, kanang nag-discuss si teacher ma'am tapoŝ na- explain siya sa concept. Tapos ang buhat, ay! Ipabuhat sa amoa kay gipa murag pareha gud sa conservative ug non-conservative force, like katong gipa-explain siya sa amoa ma'am tapos ang amoang audience ato kay Grade 6 na students. So, ahh... sa akoa ma'am kay murag kanang mas, mas ma-test jud nako akoang unsa akoang natun-an ato na topic ma'am so murag kanang akong gina... gina-ingnan ato ma'am kay bata gud ma'am mag explain ko sa iyaha maghatag kog kuan ...kanang real-life situation jud siya ma'am i-relate nimu ato na... na topic ma'am. Tapos ano kanang murag kanang unsa ang mga naa didto na forces ma'am i-explain nimu kung unsa meaning sa force gud tapos mas masabtan jud nimu ang topic ma'am. Para sa akoa mao to ang effective na physical, ay! Physics learning assessment ma'am na ma-explain nako siya sa isa ka bata ma'am about physics ma'am bisag unsa pa siya ka complex sa amoa ma'am kay since murag ahm... senior high naman mi ma'am, i-explain namo sa bata ma'am na ing-ani, ing-ana ang iyang concept, ana gud.*
(For me ma'am, an effective learning assessment is let's say, the teacher discusses then explains the concept. Then we will be asked to do, like what we have in conservative and non-conservative force, where we were aked to explain it to our audience who were Grade 6 studnets. So, ahh.. for me ma'am, I can really test what I have learned in that topic ma'am...so it's like I.. I explained to the children... it's a real-life situation where we related the topic. You explain what forces are involved there, you explain what the meaning of force is so you would really understand the topic more ma'am. For me ma'am tht is an effective physical, oh! Physics learning assessment ma'am where I explain to the children things about physics even if that is complex for us but since... we are already in the senior high ma'am, you can explain the concepts to the children, it's like that.) (*FGD with Group C, pp.30-31)
***

Jean: *Six pud kay kanang para pud sa akoa kay lack ang ano kanang practical exam gud na individual kay mas ano pud... kay ganahan pud ko magtuon pud ug ako, ganahan pud ko sa group works kay collab man. Pero usahay ma'am kay ganahan ko individual kay ano kay pag mag-collab gud mao lang man gud istoryaha.. ma-individual man gud gihapon mi kay tulo lang man mi, mag-bahin-bahin lang gihapon mi... so ma useless na ang collaboration kay consolidation nalang siya, dili na siya collaboration, hehe! mao to ma'am.*
(For me it's also a six because for me the practical and individual exam is lacking because... I prefer to study and I also prefer group works because it is a collab. But sometimes I prefer to have it individual because even if it is supposed to be a collab, it's just the same story... it still turns out as an individual because we are only three, so we still divide the task... so it becomes useless because the collaboration becomes a mere consolidation, not a collaboration anymore, hehe! That's it ma'am.)
(*FGD with Group C, p.37)
***

From FGD Group D:

> Matt: Let's say lang ha let's say,hahaha! Let's say car *na lang.. car na.. velocity ng car parang ganun or like yung ga-X,Y, Z something ganun. Like mahirap mo sya i-comprehend kung kamay lang gamitin and yung... your ballpen-ballpen or eh like pentelpen like. unsa man na? Asa man na ana-ana? I think it's much better sya kung may model talaga or kami mismo gagawa like ito, ganun, para mas maa-understand namin yong topic. And then yong sabi ni Romel yong ma absorb yong spirit gud, haahaha! so I think I rate it four kasi quiz-quiz lang, discussion and then yong discussion very fast na mahirap na din namin i-comprehend and kasi I.. as for me, understand ko man bakit mabilis ang discussion kasi yong time frame namin is very hectic or konti lang masyado pero maa.. I think .. I feel sad for those na hindi maka comprehend like hindi yong fast learner gud. 'Tas if ever mag self-learning man sila, mahirap rin para sa kanila kasi hindi nga nila gets yong topic and then mag self learning pa sila na walang mag help sa kanila.*
> (Let's just say,hahaha! Let's say it's a car... a car that... or velocity of a car or the X,Y,Z, something like that. It is really difficult to comprehend if we only use our hands and the... your ballpen or pentel pen, like what is that? Where did it come from? I think it's much better is there is really a model or we ourselves do it, so that we understand the topic better. That's what Romel mentioned about absorbing the spirit, hahaha! So I think I rate it four because we only have quizzes, discussion, and the discussion is very fast that it is difficult for us to comprehend because I... for me, I understand why the discussion is fast because our time frame is very hectic or very short but... I think.. I feel sad for those who cannot comprehend like those who are not fast learners. And if ever they do self-learning, it's hard for them because they do not understand the topic in the first place and they do self-learning wherein no one helps them.) (*FGD with Group D, p. 22)
> ***

Finally, this belief of PLA effectiveness that was discussed in this part resonated with one of the students' ways of understanding the process of PLA. As presented in the earlier discussion (see second entry of Table 11), students' understanding on how PLA is done also highlighted that it must include practical forms of assessment. This focus re-emerged in the students' expressed belief that an effective PLA must include active learning on their part. There was a preference on the students' part to experience such kind of PLA.

On the other hand, when the researcher visited the class of FGD Group A, students in small groups of five were conducting a laboratory activity on projectile motion where they measured the range of a steel ball released from a projectile launcher. The students were observed to be engrossed with the activity as they gathered their data. Majority of the students were busy doing tasks assigned (i.e. launching the ball, measuring the distances on the floor, running after the rolling ball, recording, solving and discussing). Few students, however, appeared to be mere spectators, watching what their classmates were doing. This validated what was mentioned earlier that the level of class participation during an activity did not necessarily indicate "true engagement" (Wagettie et al, 2017; Wasserstein, 1995). Unlike Groups C and D, Group A did not explicitly express the belief about PLA effectiveness that was discussed here.

(3) *PLA is effective when it is motivating.* This belief also emerged in the students' ways of understanding the process of PLA. FGD Groups B and D expressed this kind of belief about PLA effectiveness. Going back to the profile context of these two groups, both were distinct in being under the physics classes of the only two teachers in this study who had engineering and applied physics background. Group B, however, was from a public SHS, while Group D belonged to a private SHS.

Four aspects in focal awareness were revealed in this belief, namely: the motivating effect on students as indicator of PLA effectiveness; independence as an indicator of a motivating PLA; variety of PLA forms as indicator of a motivating PLA; and the close relationship among instruction, assessment and learning. The first aspect in focal awareness referred to students' belief that effective PLA forms or types were the ones that encouraged and motivated them to strive hard and give their best to learn even if no grades were given. The kinds of PLA that were believed to motivate students to become curious about the physical world and not just being a passive test-taker were indicative of being effective.

Below is an excerpt from one of the students' FGDs when they are asked to rate the effectiveness of their current PLA.

From FGD Group D:

> Ella: *Mga negative five Ma'am, negative five, hahaha! Hindi, joke! Mga negative ten, oh hahahaha! Actually for me five din tapos parang normal lang talaga na assessment, yang traditional na assessment gud instead of ... yang written-written lang sya usually... yan man talaga. As teachers diba dito sa (School Y) ginasabi natin 'magis' tapos... what if mag-isip din ang teacher ng magis not only traditional na written, hindi boring ba and then mas maganda kasi if ang assessment maka-curious ba.. "bakit nag ganyan"? Tapos and o, yun kaya five sya parang naga-go with the flow lang talaga yung assessment na hindi na nag-go beyond, yon.*
> (It's negative five ma'am, negative five, hahaha! No, just joking. It's actually negative ten, oh, hahaha! Actually it's also five for me and then it is just the normal assessment, a traditional assessment instead of... it's just usually written... that's just the way. As teachers here in school Y we keep on saying '*magis*' but then... what if the teacher also thinks of *magis* and not just the traditional written, those that are not boring and it would be better if the assessment can make you curious... "why did that happen?" Then, and yes, that's a five because the assessment just goes with the flow and does not go beyond, that's it.) (*FGD with Group D, p. 21)
> ***

The second aspect in focal awareness referred to the students' belief that an effective PLA promoted independence or self-reliance. PLA forms and types that motivated students to do a given task (i.e. quizzes, problem sets, and exams) on their own or without the help or assistance of peers or teachers indicated effectiveness.

Variety of PLA forms was believed to be another characteristic of a motivating PLA. open-ended questions where students are required to express their understanding of concepts through their own words could be included in addition to problem-solving and forced-choice formats multiple-choice. This resonated with Larkin's (2011) study on "free-writing activities" as alternative PLA that was believed to be an efficient way to reveal students' actual Physics learning. Larkin (2011) emphasized that an example of free-writing assignment may include asking students "to explain a problem or a concept that was highlighted or discussed during a class session". It wasfurther believed that through free-writing PLA, "learning can be enhanced as students take on the role of teacher through their detailed responses and explanations" (Larkin, 2011).

Another PLA format that students believed effective was requiring them to derive formulas or equations instead of mere numerical solutions. This aspect also emerged in the teachers' beliefs on PLA effectiveness (see discussion of the fourth entry of Table 12). Hence, this was a point of convergence for the teachers' and students' beliefs about an effective PLA.

Below are selected statements of students from the FGDs, about their beliefs that an effective PLA must include varied forms.

From FGD Group B:

> Harry: *Ang teacher maam, physics teacher na kana gong mag-devise sila ug new learning strategy sa student maam like, okay karun nakahibalo naman diay ta nga kanang ing-ani diay ang problema, maka-create sila ug solution gud maam like taking the... in the new level gud maam. Taking the lahi-lahi ug kanang pag -assess gud maam like "naay quiz ta, first assessment nato is mag problem-solving ta, second assessment nato is pratical, third assessment is"... ing-ana gud siya maam. Unya ang kani siya maam kay good... kay good thing ni siya nga form... form diri maam. Kay I believe na near future maam naa juy kanang pagbag-o gud jud maam sa pagtudlo sa mga physics teacher maam ba ug kanang, perspective sa studyante nga kanang ang physics dili lang siya lisod but kanang ano pud siya kanang gwapo man pud siya na subject. Nga dili lang siya pang mga bright ug math ug science.*
> (The teacher ma'am, the physics teacher must devise a new learning strategy for the students ma'am like, now that we already know that this is the problem, they have to create a solution ma'am like taking the... in the new level ma'am. Taking varied assessment ma'am like, "we have a quiz, our first assessment is a problem-solving, second assessment is practical, third assessment is"...something like that ma'am. Then this is a good thing ma'am... this is a good form. I believe that in the near future ma'am there will be a change in the way physics teachers teach physics ma'am and that the perspective of the students that physics is not difficult and that it is a good subject. That it is not only for those who are smart in math and science.) (*FGD with Group B, pp.33-34)
> ***
> Claire: *Ahh para sa akoa ma'am ang effective na learning assessment is not just ahh... knowing or understanding the topic but also knowing how... ano, sa ano pag-derive ato nga formula kay important man gud siya specially pag lahi na ang ano unit sa given. And so kung makabalo ka gi unsa pag derive kabalo ka unsaon to siya pag-ano pud sa ano sa formula like pag katong pag bali- bali. 'Tas kabalo pud ka if ano kani kung lahi ang given lahi, kulang, kabalo pud ka unsaon nimo pag ano pag-derive sa another formula. So mao to siya ma'am.*
> (Ahh for me ma'am an effective assessment is not just ahh... knowing or understanding the topic but also knowing how...to derive a formula because that is important specially if the unit of the given is already different. And so if you know how to derive, you also know what to do with the formula if things are mixed up. Then you also know if the given is different, lacking, you would know how to derive the other formula. So that's it ma'am.) (*FGD with Group B, pp.31)
> ***

The final aspect in focal awareness that was revealed in this belief was the emphasis on the close relationship among instruction, assessment and learning.

This focal awareness also emerged in the students' understanding of the purpose and process of PLA (see earlier discussions on the third entry of Table 10 and third entry of Table 11). However, it was the teacher's manner of dealing with the students that was given importance here. A teacher's pleasant and respectful attitude toward students could motivate them to strive harder hence, it was considered an essential part of an effective PLA. This showed that students' emotions were at the center of their awareness. How their teachers interacted with and treated them had an impact on their emotion and consequently, on their level of motivation to pursue a goal.

A number of studies resonated with this finding. Negative emotions were found to be negatively related to students' scores and grades (Gumora & Arsenio, 2002) while "positive emotions have been found to positively correlate with students' academic self-efficacy, academic interest and effort, and overall achievement" (Pekrun et al, 2004). Positive emotions were also argued to "facilitate approach-related activities, and these activities are likely to provide academic benefits, particularly as the student moves toward a desired goal" (Davidson, Jackson, & Kalin, 2000; Rothbart & Bates, 2006). Hence, it was important not to disregard this developmental characteristic of adolescents as it was shown here to have an influence on their beliefs and responses. Clements and MacDonald (1996) echoed this by stressing that part of the ethical responsibility for student assessment was for the teachers to "seriously consider the emotional and social impact of interpreting and giving of assessment results on the students".

Below are excerpts from FGD Group B which highlight this finding.

> Lexy: *O kanang, "sir kanang wala ko kasabot", kanang mahadlok mo- ano ba kay i-compare. Kanang, "sa inyoha tanan ikaw nalang ang wala kasabot ba". Murag ing-ana gani na feeling, kay murag lain biya jud na sa part nang ing-ana. So dapat willing ang students na kanang dapat gud ma'am kanang,kanang murag dili sila mahadlok sa kanang isa't isa ba. Kanang willing sila mutabang sa isa't isa ba. Willing maminaw ang teacher gud sa mga pangutana sa student, na willing siya na tabangan ang student bahala siya nalang isa. Kanang tabangan jud niya ma'am ba...kay ang uban*

student biya ma'am kay nakasabot naman ang uban unya siya nalang ang wala kasabot, "ay sige uy sagdaan nalang.. tiis-ganda nalang ta ani". Murag tiis-tiis nalang ta ani hehe! So kanang ing-ana ma'am, kanang gina pasagdan nalang niya kay tungod mahadlok siya nga i- degrade, ana.
(Yes, like, "Sir I did not understand", but you are scared to be compared. Like, "you know it's only you who still does not understand among the rest". You know that feeling is not really nice. So the students must be willing ma'am to not be afraid, that they should not be afraid with each other. They should be willing to help each other. The teacher must be willing to listen to the students queries, that he/she is willing to help the student even if he/she is just the only one among the many. That he/she should really help ma'am... because there are students who when realizing that he/she is the only one in the class who still does not understand would say, "never mind... just bear it gracefully". It's like, let's just bear with it, hehe! So it's like that ma'am, he/she will just let it be because he/she is afraid that he/she will be degraded.) (*FGD with Group B, pp. 32-33)
***

The students' utterances and expressions repeatedly acknowledged that instruction, PLA and student learning affected one another in the way they see their lived experiences with PLA. Students believed that should one wish to create a positive impact on their Physics learning, teacher instruction or the way of teaching Physics and the kind of PLA that is given to them must be first improved.

(4) *PLA is effective when it encourages students toward peer collaboration.* FGD Groups B and C expressed this belief about PLA effectiveness. The students described informal kind of PLA activities that allowed peer collaboration. Informal PLA activities are those that do not have structured quatifying mechanism such as having an equivalent score or grade. Such informal PLA activities include group discussions when doing a given task like solving problem sets and peer tutoring. In peer tutoring, the expert-like peer (the tutor) could assess his own learning when his student (the tutee) understood his or her explanation. On the other hand, the recipient of the peer tutoring also benefitted as he or she understood better and was more comfortable with the way his or her peers were teaching.

This student belief matched Akyol and Garrison's (2010) view that discussion and interaction with peers in a learning community are ways for students to develop deep learning. It also agreed with what Crouch and Mazur (2001) called peer instruction as a way of improving learning. Crouch and Mazur (2001) emphasized that since learning is social, peer instruction can "uncover difficulties with materials and engage every student rather than a select highly motivated few". The big role that peers play was revealed in this students' belief of what makes an effective PLA.

In support of this part of the findings, the following excerpts from the students' FGDs are given below.

From FGD Group B:

> Roel: *Ahh... Feel pud nako ma'am na mas effective ang ano ang learning assessment kung ka uban nimo nang peers gud nimo ma'am, kuanon nimo ma'am kay ano m'aam... para sa akoa kanang, para sa akoa kay mas ma comfort... komportable man gud ko's ilaha m'aam. Kanang kuan ma'am ba, anytime pwede ka ma- ask ug question, kay naa man goy uban perspective sa students na kanang murag tan-aw nila sa teacher kay murag terror, hala! Kanang hadlok kaayo ma'am, murag dili siya approachable so.. o basi mapaulawan ka ma'am or kanang mag pangutana ka murag basig ma.. i-degrade or i-down pa ka ba na murag wa nimo nasabtan so... ay dili man siguro tanan teacher ing-ana pero murag ang ano ma'am na mindset sa uban tao so... mao to ang kanang feel nako na mas kuan maam mas effective jud kong mag-ano ka magtuon ka or para masabtan nimo ang isa ka concept with... together with your own ano with your peers or classmates.*
> (Ahh... I feel that a learning assessment is more effective when you are with your peers ma'am, you will... for me, for me it is more comfort... I'm comfortable with them ma'am. It's like, you can ask question anytime, because some students perceive a teacher as terror, oh no! It's really scary ma'am, it's like he/she is not approachable so.. or you'd be embarrassed ma'am or when you ask something you might be... degraded or put down because you still have not understood so.. but I'm not saying that all teachers are like that, but it's the mindset of other people ma'am so... that's it, I feel that it will be more effective if you study or for you to understand a concept with... together with your own ano with your peers or classmates.) (*FGD with Group B, pp.29-30)
> ***
> Jake: *Tama pud to kanang peer gani ma'am nga kanang for example, magtabangay mo, kanang mag-solve mo'g isa ka problem. Kanang group work gani ma'am. Murag something mag-solve mo isa-isa unya kanang i-compare dayun pag ana, tama iyaha, at least matudluan niya na gi-unsa niya pag-solve... ana gani maam.*
> (It's also right ma'am that a peer for example, you help one another, you solve a problem. It's a group work ma'am. It's like you solve individually first then compare after, if the other's answer is correct, at least he/she can teach the other how it is solved... something like that ma'am.) (*FGD with Group B, pp.29-30)
> ***

From FGD Group C:

> Faith: *Ah... for me, six kasi okay.. ay! Kahit anong way man gud never, ay never ko talaga na experience na... never pa ako naka-experience ng ahm... physics na ahm... or teacher na explain talaga sa akin ng maayos physics. Kay the subject itself I don't like it and kay di ko siya maiintindihan. Di ko siya ma appreciate so, ano pero sa ngayon ahm... at first kay nagusto ko pa kasi siya na by group so I don't have to suffer. O, ha may karamay ako. Hahaha! Collaboration and okay pud siya kay ang classmate nako si Danna, ka groupmate mi kay siya bright so makasabot ko sa iyahang way of teaching. So ma-explain niya sa akoa ug tarong kaysa sa ahm...*

amoang teacher. Si sir... ay amoang teacher man gud kay murag dira na siya mu-explain pag kabalo siya sa... ay kanang murag iyahang way man gud is maghatag sa siya ug activity and ahm... whatever the result is dira niya i-base kung asa mi kulang, asa mi wala kabalo, ana gud.

(Ah... for me it's six okay...Oh! Whatever way it is, I have never, I've never experienced ahm... physics that ahm.. or teacher who really explains physics very well. Because the subject itself I do not like and I don't understand it. I cannot appreciate it, but now ahmm...at first I tend to like it so far because it is by group and I don't have to suffer. Yes, because I have someone who sticks with me. Hahaha! It's collaboration and it's okay because my groupmate Danna is smart and I can understand her way of teaching. So she explains it to me better that ahm... our teacher. Sir... or our teacher only explains if he knows... his way is that he gives an activity and ahm... then whatever results , he bases here the things that we still lack, the parts that we still do not know, it's like that.) (*FGD with Group C, p.36)

***

Students' Beliefs About PLA Efficiency

The same with the teachers, the students were not given prior descriptions of what efficiency was. Instead, they were prompted to reflect on their lived experiences of PLA particularly on their beliefs about efficiency when applied to PLA. This was done in order not to lead the students into the researcher's own beliefs or to bracket the latter's own biases (Orgill, 2002). Based on the expressed personal accounts of the students, four qualitatively different beliefs on PLA efficiency were seen to emerge.

Table 15 shows the captured students' beliefs on PLA efficiency. Following the said table is the discussion of each belief and the aspects that emerge in focal awareness.

Table 15 Students' Beliefs About PLA Efficiency

Beliefs on PLA Efficiency	FGD Group(s) Which Expressed the Given Beliefs	Aspects in Focal Awareness
1. PLA is efficient when it provides enough time for the students.	Groups A, B and C (Group A was from a private SHS while B and C were from a public one. Unlike Group D, the physics teachers of these three groups had education degrees major in science teaching and were all licensed professional teachers.)	*Provision of longer time as indicator of efficiency *Close relationship among instruction, PLA and learning
2. PLA is efficient when it encourages long-term retention of learned concepts.	Groups C and D (The two groups with the most number of females and JHS awardees)	*Retention of concepts learned *Connection between past and present learning
3.PLA is efficient when it is appropriate to the students' learning capabilities.	Groups B, C and D (All were under physics teachers who had relatively more experience than the teacher of Group A, Teacher A)	*Variety of PLA forms
4.PLA is efficient when it provides and responds to feedback for student improvement.	Group A (From a private SHS; had the most number of males than females; under the youngest and least experienced teacher)	*Provision of action as response to a certain feedback

(1) *PLA is efficient when it provides enough time for the students to learn.* This belief was common to Groups A, B and C. Unlike Group D, these three groups were all under physics teachers who had formal education training and professional teacher's license (Teachers A, B and C, respectively). These were also the groups whose teachers' views and beliefs about PLA were generally based on their adherence to the curriculum guide. Most students from these three groups believed that their actual level of Physics understanding was not just their ability to solve problems in a short of time. If enough time were provided, they believed that their

PLA scores would indeed represent their level of physics understanding. This was believed to constitute an efficient PLA.

The provision of longer time for the Physics class was believed to be related to having an efficient PLA. Students from the said three groups viewed Physics as a relatively difficult subject that requires longer time to understand. Providing more time would result to better and deeper learning and consequently better performance in any PLA form. As noted in the earlier sub-sections, this aspect in focal awareness, the close relationship among their teacher's instruction, PLA and their Physics learning repeatedly emerged in the students' understanding and belief. Hence, it played a big part in how they see their lived experiences in and of PLA.

The teachers and students had two contrasting belies of PLA efficiency. While students focused on the provision of longer time for PLA efficiency, teachers emphasized the faster coverage of the required learning competencies as equivalent to PLA efficieny (see earlier discussion of the second entry of Table 13 on teachers' beliefs on PLA efficiency). The teachers centered on adhering to an existing educational policy while the students focused on achieving deep Physics learning.

The following are excerpts from student FGDs in support to this finding.

From FGD Group A:

> Jay: *Parang hindi sya in a matter of minutes ma'am ba. Like kung paano mo man gud ma-apply ang concepts hindi mo man sya like parang limit ka lang nya in a matter of minutes.. ahmm... mahaba man ang time na pwede mong gawin yung task like writing of lab reports, however, kapag kasi quizzes and ETs na, yon solving talaga on the spot, hindi practical yung time ginabigay because in real-life... because of the time binibigay ma'am doon nagfifail ang students. Yun ang masakit so grabe naga-focus masyado ang PLA on the speed of the student, kung kaya ba nya i-solve ang problem in this speed. So it is very disadvantageous for those who are very slow learner maam.*
> (It should not just be in a matter of minutes ma'am, like how can you apply the concepts if you are just limited in a matter of minutes... ahmm...Though you are given a long time to the taks like lab reports, however, in quizzes and ETs (enabling tasks), that's on the spot solving, the given time is not practical because in real life... students fail because of the given time. That's what makes it painful because the PLA is much focused on the speed of the student, if he/she can solve a problem in this speed. So it is very disadvantageous for those who are very slow learner maam.)
> (FGD with Group A, p.22)

***

Kea: *Kung ako mag-rate kasi siguro five or six lang. Marami akong kilala na pagmagtest sila kay memorize lang nila, pagkatapos kay wala na mag-move on na sila. Mag-move on na sila, wala ng learning kay pagkatpos kalimotan man nila. So ang ginagawa lang nila para makapasa sila. Kung dili sila makasapasa, dawat lang nila. Sa next na naman assessment doon naman sila magmemorize na naman sila. Instead na makalearn, ang kanilang learning kunuhay kay yun ang kanilang memorizing. Gina-familiarize lang nila, kay ginamemorize wala jud silay nasabtan.. sayang lang.. so inefficient sya na PLA ma'am.*

(If I were to rate it, it would just be five or six only. I know many who just memorize things when they take a test, then after that they just move on.They just move on without any learning because they just forget everything after. So they just do that in order to pass. If they do not pass, they simply accept it. They'd memorize again for the next assessment. Instead of really learning, their learning is the memorizing. They just familiarize, they memorize without understanding.. it's just a waste... so it is an inefficient PLA ma'am.) (*FGD with Group A, p. 23)

From FGD Group B:

Lexy: *Ahh... Para sa akoa ma'am kay six ahh... six siya kay dili man nimo ma- blame ang teacher.. ma-blame nimo ang schedule, ang time. Fifty minutes lang man gud ma'am ang amoa jud tapos lisod jud kaayo siya ma'am sa amoa kay physics. Taas jud among coverage. Tapos gamay lang ang time para exam unya daghan kayo. So dili mi mang-blame kay ang time pati si sir kay naga-ano man pud siya sa time. Kulang daw kaayo ang fifty minutes. Ing-ana tapos syempre lecture pa ana tapos naa pay uban na dili makasabot sa... "sir nganu gani to?" unsa gani na pag ana ana."? So murag dili jud siya efficient para sa amoa. Tapos kanang ang ano pud kanang the way pud na kanang sige lang pa quiz, ana gani. Murag dapat kay murag four days man so murag better siya na ma naay isa ka day nga pratical something, ana-ana gani para mas dali para sa amoa kay kulang man jud kaayo sa time ma'am. Fifty minutes per subject lang unya lisod biya jud sabton ang physics.*

(Ahh... it's six for me ma'am because ahh... it's a six because we cannot blame the teacher... we blame the schedule, the time. We only have fifty minutes then physics is difficult for us. The coverage is long. The time for the exam is very short but it has a wide coverage. So we really cannot blame the teacher because he himself also says that fifty minutes is not enough. Then there's lecture and other students cannot understand easily... "why is is like that sir? How do we do this?" So it's not efficient for us. Another thing is the frequent quizzes. We only meet for four days so it's better if there is a day for something practical, something like that so that it will be easier for us because the time isn't really enough ma'am. It's only fifty minutes per subject and yet physics is difficult to understand.) (*FGD with Group B, pp. 39-40)

***

From FGD Group C:

Ninna: *Kanang hinay-hinayan sa estudyante ang concept, niya hatag ug activities, quizzes para ano ma'am ba murag ma ma-enlighten jud ang bata or ang estudyante, "ay ing-ani diay ang pasabot sa topic". Kay kung dali-dalion man gud ma'am kanang okay na nasabtan na, okay nahuman na next na pud.. ana gud ma'am like, ha? Unsa daw? Like murag ikaw dili ka ka-catch up kay mao to imung nasabtan ma'am niya lahi napud ang mosulod sa imuha. Kanang murag mabuang naka sige'g huna-huna ma'am ba. Hala! Naunsa diay to? Mabalik-baliktad nalang nimu usahay na ing-ani diay ang concept.. ana ana gud. Maong para sa ako three out of ten lang gyud ang efficiency sa among PLA ma'am.* (laughs)

(The concept should be taught to the students slowly, then activities, quizzes whould be given ma'am so that the students will really be enlightened, "so that's what the topic means". Because if it is done hastily ma'am, it's like, okay it's already understood, okay it's done so proceed to the next.. like, what? What is it again? It's

like you cannot catch up anymore because you just understood it but then there's another one that is given to you. It's like you'd get crazy thinking about it ma'am. Oh my! What just happened? Then you get to mix up the concepts, something like that. That's why it's PLA efficiency for me is only three out of ten ma'am. (laughs) (*FGD with Group C, p.42)
***

Gem: *Efficiency mga five siguro, hehehe! Kay murag dili kaayo siya efficient way na mag ahm... karon kay murag karon, murag more on complex lang kay katong giingon ni Faith ganina kung maghatag si Sir ug mga activities... so kung example ma-answeran namo ni nga topic is kay muderestso na siya. Mu-skip na, "ay nasabtan na sa bata", so deretso na sad sa another topic... so murag di na mi kasabot sa kato na ano. Though na answeran na namo, malay mo gi-tsamba-tsambahan lang diay to sa bata or kanang nangopya lang, isa ra'y nakasabot, ana-ana. So murag dili siya efficient.*
(I think efficiency maybe is a five, hehehe! Because it's not really that efficient... because as of now. it's more on complex things only just like what Faith said earlier that when Sirgives activities... like when we are able to answer an example, he immediately goes to the next. He skips like, "the students already understand", so we proceed to the next topic immediately...so we no longer really understand it. Though we were able to answer it, you never know if the students were just lucky in guessing the answer or maybe they just copied, only one really understood, something like that. So it's not really efficient.) (*FGD with Group C, pp. 40-41)
***

(2) *PLA is efficient when it encourages long-term retention of learned concepts*. FGD Groups C and D both expressed this belief about PLA efficiency. Common and unique to both groups were the composition of their groups wherein mostly were females and JHS award recipients. Their physics teachers also had distinct educational backgrounds. Group C's teacher (Teacher C) had the highest educational level by being the only one who reached the post-graduate level in physics education, while Group D's physics teacher (Teacher D) was the sole teacher who had Applied Physics degree and an industry experience as a research analyst.

This belief about PLA efficiency emphasized retention of Physics concepts learned in the past and its connection with the present. Students from the said two groups generally believed that when PLA, in any form or type, measured temporary or short-lived knowledge that usually lasted only until an assessment was through, it was a waste of learning. Wasting resources like their learning and effort, makes a PLA form inefficient. On the other hand, an efficient PLA is one that assesses students deep understanding of the basic and fundamental concepts and principles that they could easily connect and integrate with current learning. Retained physics concepts which accumulate through time enable students to solve more complex problems, hence, believed to be an indicator of an efficient PLA. This belief on PLA efficiency was found to be unique among the students as it did not appear in the teachers' utterances and expression. The following are selected excerpts from the students' FGDs which highlight this finding of the study.

From FGD Group C:

> Gem: *Ahm, efficient. Para sa akoa kay efficient kung ang isa ka topic is balikon niya sa pinaka- sugod like na sa basic kay... kay natun-an namo sa among isa ka teacher, if you ahm.. just go back to basic.. ay unsa tong giingon ni sir? "If you encountered hard problem, just go back to basic". And then physics is a hard problem so kinahanglan ka mubalik sa basic kay para mas masabtan jud sa bata kung asa gikan ug ngano, gina-unsa na pag solve. Kanang mabalikan tong mga past na natun-an ma'am ba.*
> (Ahm, efficient. For me it is efficienct if a topic allows you to go back to the basic because... because we learn from one of our teachers that if you ahm... just go back to basic.. What did sir say about it? "If you encountered hard problem, just go back to basic". And then physics is a hard problem so you really need to go back to the basic so that the students will really understand where it comes from, how it is solved. The past learning will be revisited ma'am.) (*FGD with Group C, p. 40)
> ***

From FGD Group D:

> April: For me *po I would take' yung suggestion ni Andrew na repetitive na assessment para it's a way to ..aah mastery. It's a way to exercise, yung mga exercise problems ba to prove... para ma-assess talaga kung naintindihan ba namin ang certain topic and easier sya.* (For me I would take the suggestion of Andrew about repetitive assessment as a way to... ahh mastery. It's a way to exercise, those exercise problemsto prove... in order to really assess whether we have understood a certain topic and it is easier.) (*FGD with Group D, p. 24)
> ***
> Matt:*Ang pag-understand ko sa efficient... so if i-apply ko sya sa efficient physics learning assessment kasi dapat kung like ahh... halimbawa, let's say yung relative velocity. Dapat na-understand ko na gani. 'Pag ma-understand ko parin sya throughout the lessons,ma-apply ko ulit ang relative velocity... let's say nag-a solve ako for ahmm...intantaneous velocity... ganun and then may part don na hala! Kailangan ko pa pala kunin ang relative velocity and then kinalimutan mo na si relative velocity, hindi ka maka-proceed sa problem. So I think na dapat ahhhhh... efficient 'yon na PLA kasi gina-require ka na i-apply yung alam mo na dati. I-recall, then maremember mo sya or ma-retain mo sya.)*
> (The way I understand an efficient... so if I applied it in an efficient physics learning assessment it has to be like ahh... for example, let's say relative velocity. I should have understood this already. If I still understand it all throughout the lessons, I can apply relatie velocity again... let's say I solve for ahmmm... instantaneous velocity.. and then there's a portion there where it's like, "Oh! I need to determine the relative velocity first and then if you already forgot relative velocity, you cannot proceed in the

problem. So I think that it must ahhh... it is an efficient PLA because it requires you to apply what you already learned in the past. You recall then remember it so you retain it in you.) (*FGD with Group D, p. 26)
***

(3) *PLA is efficient when it is appropriate to the students' learning capabilities.* This belief about PLA efficiency was common among three FGD Groups B, C and D. Unlike Group A whose teacher was the youngest and with least educational attainment, these three groups were all under physics teachers who had relatively above the minimum educational background for teaching. As mentioned earlier, Group B's teacher had an engineering degree aside from his education degree; Group C's teacher had a PhD level in physics education; and Group D's teacher finished Applied Physics and had research background particularly in industry practice.

The aspect in focal awareness of this belief about PLA efficiency was the provision of a variety of PLAs to cater to the different needs of the students. This aspect was seen to be re-emerging as this was also revealed in one of the students' ways of understanding the process of PLA (see early discussion on the third entry of Table 11). It was believed that providing varied forms and types of PLA addresses the need for appropriateness of PLA with the students' learning capabilities. Instead of the usual quizzes, problem sets, exams and the like, students believed that inclusion of practical exams and ungraded hands-on activities contributed to the level of efficiency of PLA. When the form and type of PLA is appropriate to the students' learning capabilities and readiness, resources such as time is maximized. In this case, students' belief on PLA efficiency was based on their understanding of efficiency as wise utilization of resources.

Another angle of this belief was the emphasis on the appropriateness of teaching materials such as reference books to the current state of readiness and capabilities of the students. This was believed to be another indicator of an efficient PLA. It was believed that when a certain material that was used by a teacher was beyond the students' level, particulariy in terms of difficulty, then it could not maximize students' learning. As a result, students more likely would not gain a deeper understanding in and appreciation of Physics. Hence, it was a form of squandering of time and energy which was deemed as indicative of inefficiency.

The finding on teaching materials discussed above revealed the presence of both points of divergence and convergence between the teachers' and students' beliefs of PLA efficiency. When it came to using a college-level reference book as a PLA source in senior high school Physics, teachers' belief implied that such was efficient as it saved time for the designing and checking of PLAs (see earlier discussion on the fourth entry of Table 13). On the other hand, students believed that such instruction and PLA practice was inefficient as it wasted students' time and effort and led to no gain in Physics understanding. Hence, there was divergence in the teachers' and students' beliefs of the efficiency of using a college-level reference book as PLA source. For the convergence, it was the similarity of teachers' and students' understanding of efficiency as indicated by either maximization or wastage of resources such as time and effort.

The following excerpt from students' FGDs are given below in support of this part of the findings.

From FGD Group B:

> Jake: *Para sa ako maam, efficient nga assessment kanang murag ha-um siya sa learners na kanang... diba ni ingun ko m'aam na lahi-lahi ug ano learning capabilities? Murag efficient kanang... kato siya na assessment kay murag bagay pud ato na mga kind of learnings. For example, ang mga learners is auditory, kana somewhat pud ang assessment is in line pud ana, murag efficient jud siya ma'am ba.. ana kanang nag corelate.. Ay! Unsa something na parallel siya o compatible siya sa student ang assessment.*
> (For me ma'am, an efficient assessment is something that is fit to the learners...didn't I mentioned earlier ma'am that there are different learning capabilities? Efficient is something like... an assessment that is also appropriate for the kind of learnings. For

example, if the learners are auditory, then the assessment must also be in that line, it's really efficient ma'am... they correlate. Oh! It's something parallel or compatible, the student and the assessment.) (*FGD with Group B, p. 35)

***

Claire: Hmm... For me, *ang efficient na.. na learning assessment sa physics is that ahmm... parehas sa gi-ingun ni Toni na mo bagay siya sa topic at the same time mo bagay pud siya sa type of students' kay para walay ano ahmm... tawag ani resources na masayang. Walay time na masayang ana gud maam, murag enough siya.*

(Hmm... For me, an efficient... learning assessment in physics is that ahmm... similar with what Toni said that it should be fitting with the topic and at the same type with the type of students so that there'd be no ahmm... resources that will be wasted. No time will be wasted, something like that ma'am, it's like it's enough.) (*FGD with Group B, p. 36)

***

Janna: *Sa akoa ma'am kay mostly man gud ang kay Sir perminti man gud kay kanang ano kanang murag ang mga ahhh... kanang pag-solve-solve gud na permenti sa iya ma'am. Ang mga quizzes sa ana unya mga summative, hahaha! Pero sa akoa man gud ma'am kay murag mas gusto nako kanang application gud. Kanang makit-an pud namo ba kung gi-unsa siya pag-apply. So sa akoa mga six or seven lang pag permenti puro quizzes. Unya basi naay uban tao na dili gud makasabot sa concept so unsaon niya pag sabot na ig-ato gud ma'am.*

(For me ma'am, sincewhat Sir always gives is something like ahh... it's always about solving ma'am. The quizzes and the summative, hahaha! But for me ma'am I would prefer application. Those which actually show how it is applied. So for me it's just six or seven only if it's always just quizzes. Then if there are other people who do not really understand the concept, how else can they understand, something like that ma'am.) (*FGD with Group B, p. 39) ***

Queen: *Ano man gud ma'am, although ganahan ko sa subject na physics pero, more ang assessment na ginahatag niya is more on problem-solving. Murag ano siya ma'am ba dili siya varied gud ma'am. Dili lahi-lahi like, for example pag mag-test na siya ug kanang objective types kay mugamay akoang score, so what if na lang kung naa nay application. So ing-ana unta ma'am ba kanang naay variety sa assessment para ma-test jud imuhang ano na learn. Kay maski unsa pa na ang assessment ang ihatag sa imuha kung naka-learn jud ka, ma answer jud nimo tanan.*

(It's like this ma'am, although I like the subject physics but, the assessment that is usually given is more on problem-solving. It's not varied ma'am. It's not in variety like, for example if the test is objective types, my score usually goes down, so what more if there's application.So I hope that there's really variety in the assessment so that what you learned will really be tested. Because whatever assessment is given to you, if you have really learned, you can answer it all.) (*FGD with Group B, p. 39)

***

From FGD Group C:

Faith: *Siguro para sa akin kay gusto ko man ng practice so mag-discuss siya in a way na masabtan para masabtan pa pud. Magpa-activity pero dili lang recorded and 'yang activity na mas masabtan namo. So pwede siya magbuhat-buhat lang kay ang amoa man gud ahm... reference book nosebleed kaayo siya, mura siya'g pang college.--- First year college naman dapat mi pero gina-prepare pa man mi, dili pa man mi college. Murag naga-ask na ko ug simpler and ahm... murag hands-on pero dili sa siya i-recorded. Murag activities na murag dili lang problem- solving tanan. Dapat masabtan sad namo ang concept. Dili lang why we answering this. Why we calculating this? Unsa ma'y relevant ani sa among life? Ana gud..so di jud siya namo ma- appreciate. Hehe!* (students laughing)

(Maybe for me ma'am, since I prefer to practice, he should discuss in a way that it can really be understood. An activity that is not recorded can be give and an activity that we can better understand. SO he can make his own because what happens in our ahm... the reference book is so difficult, it's like for the college. --- We're supposed to be first year college by now but we are actually just being prepared, but not yet college. I'm asking for a simpler and ahm... like a hands-on that is not

recorded. Activities that are not just everything on problem-solving. We should understand the concept. Not just why we are answering this. Why are we calculating this? What is its relevance in our life? Like that... so we really cannot appreciate it. Hehe!) (*FGD with Group C, pp. 43-44)
***

From FGD Group D:

Matt: For me it's four.. *kasi for.. as I observe Ma'am so far for the past four months na, diba kasi it's more on quiz lang and quiz and ET (enabling tasks). Then yung discussion, it's very fast na mahirap na i-comprehend ng ibang learners. And then each mag-self study na and then peer tutor na nga paminsan like sa yung... yong always ay... usually sa ET may peer tutorial talaga mangyari.. so I think four sya kasi wala.. hindi kami... wala kaming application. Di namin sya... although magsabi yung teacher ng application like, like gina-discuss, "so you could apply this probably", pero kanang as kami, like let's say wala talaga kaming practical. Let's say practical quiz ba or exam na ginagawa so mahirap sa amin i-understand ang certain... let's say velocity ng ng running chairs, something ganun.* (students laugh)
(For me it's four... because... as I observe ma'am so far for the past four months already, isn't it just more on quiz and quiz and ET (enabling tasks).Then the discussion, it's very fast that it difficult for the other learners. And then each does self-study and sometimes peer tutor... it's always... usually in the ET there's really peer tutorial that happens.. so I think it's four because there's no... we do not have application. We cannot... although the teacher mentions an application like, it is discussed, "so you could apply this probably", but for us, there's really nothing practical. Let's say either a practical quiz or exam so we really find it difficult to understand certain... let's say the velocity of the running chairs, something like that. (students laugh) (*FGD with Group D, p.22)
***

(4) *PLA is efficient when it provides and responds to feedback for student improvement.* This belief was unique to FGD Group A. Unique to this group was their teacher's relatively limited teaching experience and background. In this belief, the stress was not just on the provision of feedback to students regarding their PLA scores or standing but more on the actions taken after giving the feedback. It was implied in this belief that feedback would be futile when no concrete steps were taken to address it. When students' PLA performance, as shown in their scores, was low, this could be a feedback to the teachers that they had not reached any learning or understanding yet. This must be a signal to the teachers that called for a "fixing" before moving on to teaching other competencies. Hence, more than the provision of feedback to learners is the provision of concrete actions in response to what the feedback is showing. The giving of feedback and providing concrete actions in

response were believed to be indicative of an efficient PLA. Moreover, students expressed that "fixing" of what needed to be fixed may include reinforcement and emphasis on students' strengths, as well as clarification of difficult areas in the lessons that were covered in a certain PLA.

This finding revealed that students believed on the contribution of feedback with concrete actions to their Physics learning and understanding and to PLA efficiency. This further implied that students believed that the formative aspect of PLA adds to its efficiency. This finding resonated with the study of Nicol and Macfarlane-Dick (2006) which argued that feedback is effective when it: "makes clear what good performance is with respect to the learning objectives, goals and criteria; encourages dialogue between teachers and peers about learning; and enables students to bridge the gap between current and optimal performance".

The following are selected students' statements from FGD Group A when asked to rate the efficiency of their PLA. These are given to highlight the finding that is presented in this part of the study.

> Phil: Ahmm... I would like to rate the PLA six out of ten efficiency of PLA. First of all ahm... it has small room to improve ma'am... because I have seen that the PLAs in our physics... in the PLAs are only assessments and there is no action or ahm... there is no fixing in what is... what are needed to be fixed ma'am. They choose to assess our learning and then we move on. (*FGD with Group A, p. 22)
>
> ***
>
> Eman: I agree with Phil, I rated it six to seven. *I agree with his ano na after the assessment parang wala lang. Move lang diritso. Parang, there should be action taken para that should be able to cater the needs of the students. For example, if majority failed, ahh.. there should be like not really a make-up class but a session that will ano... would be able to clarify all the ahm.. be able to clarify the concepts which the student fails to grasp. Parang i-emphasize lang talaga yung points. Kasi para mas... para in the long run hindi nya makalimutan agad.*
>
> (I agree with Phil, I rated it six to seven. I agree with what he said that nothing happens after an assessment. We just move on. Perhaps there should be action that is taken so that should be able to cater the needs of the students. For example, if majority failed, ahh.. there should be like not really a make-up class but a session that will... would be able to clarify all the ahm.. be able to clarify the concepts which the student fails to grasp. Something that really emphasizes the points. So that it will be more... so that he/she will not forget it in the long run.) (*FGD with Group A, p. 23)
>
> ***

Teachers' and Students' Experiences of PLA

Reasearch question 3 asked about what teachers and students find signficant in their experiences of PLA as inferred from their stories about, emotions and insights from these experiences. In this part of the study, the teachers and students were asked to reflect on their experiences of PLA and share one story that they considered as the most significant. The basis of the significance depended entirely on them. The emotions that they felt during and the insights that they gained after the said experience were also shared to the researcher. These significant stories tell a lot about how they view, understand and believe about PLA (Marton, 2000). An experience that was valued as significant by an individual revealed the aspects that were central to the structure of his or her awareness (Marton, 2000).

Out of the individual significant stories, emotions and insights gained from the experiences, phenomenographic analysis dictates that the emerging different collective aspects in focal awareness be emphasized (Marton and Booth, 1997). Hence, the personal accounts were not presented individually, rather, commonality on their focal points were determined. Each kind of collective focus revealed one way of experiencing PLA as a phenomenon. In other words, in every significant story and the corresponding emotions and insights of the teacher and student that came with it, the researcher looked into the aspects in focal awareness that made the said experience significant in the eyes of the teacher and student. This captured what the researcher coined as the "centrality of the significance" of an experience. Three kinds of centrality emerged in the analysis of teachers' experiences of PLA.

Teachers' Experiences of PLA

Table 16 shows the aspects in focal awareness (centrality of significance of an experience) among the teachers' shared personal accounts of their significant stories, emotions and insights of their lived experiences of PLA.

Table 16 Centrality of Significance of Teachers' Lived Experiences of PLA

Centrality of Significance	Emotions	Insights	Teacher(s) Who Expressed the Given Experiences, Emotions and Insights
1.Impact of the experience on the lives of students after SHS	Sad and offended versus Happy and fulfilled	*Focus on ways of improving Physics teaching and PLA administration; *Values-integration	Teachers A and B (Teacher A was the youngest and least experienced while Teacher B was the oldest and most experienced. Both had formal education training and professional teacher's license.)
2.Impact of students' readiness in physics on teacher's view of teaching	Shocked and frustrated	*Values-integration for teacher's and students' self-improvement	Teacher D (The only one without education degree and teacher's license; the only one with Applied Physics degree and background in industry research)
3.Impact of tension between how PLA should be done and how it isactually be done on teaching and learning	Satisfied and hopeful	*Role of teachers in curriculum improvement	Teacher C (The only one with a PhD level in physics education)

The following paragraphs discussed the three emerging centralities of ignificance of the teachers' shared most significant experience of PLA. The motions evoked and insights they gained from it were also discussed.

(1) *Impact of the experience on the lives of students after SHS*. Two of the our teachers (Teachers A and B) had this centrality of their shared significant tories. Teacher A was the youngest and with the least teaching experience while eacher B was the most senior in age and teaching experience. Both teachers, owever, had formal education degree and professional teacher's license.

Teacher A shared about the massive cheating that involved a number of his lasses and the classes of the other Physics teachers in their school. Teacher B's tory was about a performance task that required the students to manually write their olutions to two hundred fifty to five hundredword problems. Though these two tories appeared to be different, analyzing more deeply into them through the henomenographic lens revealed that their commonality was on the perceived npact of the said events on how the students would be in the future.

Teacher A believed the involvement of his students in a relatively big-scale heating reflected how they would most likely be in college in moments of academic hallenges, difficulty and desperation. In such times that were believed to be esperate in the context of passing or failing a subject, Teacher A believed that tudents might resort to cheating as an easier way to pass. The impact was erceived to go beyond their college years as it could also reflect in the kind of rofessionals that they would be in the future. In other words, the shared significant tory was centered on the future dimension of the the impact of the experience on he students.

Similar to this, Teacher B's significant story focused on the impact of his PLA style on the readiness of the students in taking STEM-related programs in college. It showed how his educational background in engineering influenced his views of how to best train his future engineering students.

It was noted that the emotions felt by the teachers in the said stories appeared to be polar: one was sad and offended while the other was happy and fulfilled. Thinking that his students made the wrong choice when they cheated made Teacher A sad and offended. On the other hand, Teacher B perceived that his practice would benefit the students in the future and was happy and fulfilled because of this.

The following excerpts are given below in support of this finding.

> Teacher A: *Naguol ko ma'am. Nalain ko ma'am oy! Lain kaayo, ma'am. There are many ways to ano gud... na—na-hurt ko sa, sa mga students kay, ano man sya ma'am... Ma-ulaw ko sa ila, oy. Nalain ko ma'am oy .. kay murag kanang... murag... wala'y purpose ang pagtudlo kay murag... mag-resort lang man diay sila gihapon sa easier way to do it. Murag ana ba. Gi-ingnan nak—nag-ano lang ko ma'am, nagpa-reflect ko about it na kanang sa nahitabo. Unsa sa tan-aw nila.. kung makatabang ba to sa ilaha pag mag-college na sila nga ma-involve ug ing-ato kadako nga cheating.*
> (I was worried ma'am. Ofcourse ma'am I was really offended! It was not good ma'am. There are many ways to... I was hurt by my students ma'am because it's like... I was embarrassed by them. I was offended ma'am... because it's like... teaching has lost its purpose because... they would still resort to the easier way to do it. Something like that. I told them- I just ask them to reflect about what happened. What they think is... if getting involved in that scale of cheating can help them when they go to college.)
> (*Interview with teacher A, p. 40)
> ***
> Teacher B: *Pagdawat nako sa ilang mga notebooks...aaah ofcourse happy, kasi.. and of course, fulfilling as teacher. Actually I, I am, kasi meron akong nabasa kasi na ang problema kasi sa mga, sa mga bata ngayon, ayaw na magsulat. Photocopy-photocopy na lang. And then, nakalimutan yung writing because... kaya sabi ko nga kanina, meron akong nabasa na book na there is a secret in writing na, for example magso-solve ka nang problem. Kaya nga I always encourage them na yung mga sam—yung mga solved problem ko sa board, pagdating sa bahay, i-rewrite yun. I-rewrite. Copy the problem, and then aah, master the steps how to solve the problem and after that, close their note, i-solve nila wala yung guide...—walang guide kasi, mas mainam yun na talagang ma-a-absorb nya yung lesson. Kasi, ang background ko engineering. Kasi sa engineering naman, alam naman sa engineering na sariling sikap talaga. And I always prepare them for college life especially for engineering life, kasi most of them will go to engineering field kaya sinanay ko sila sa solving.*
> (As I received their notebooks... aah ofcourse because... and ofcourse it's fulfilling as teacher. Actually, I have read something about the problem with today's students, that they do not like to write. Everything is just photocopied. And then, they already forget writing,for example solving a problem. That's why I always encourage them that the sam – they rewrite the solved problems on the board at home.They rewrite it. Copy the problem, and then aah, master the steps how to solve the problem and after

that, close their note, then solve it without the guide...—no guide because that would really be better if he/she absorbs the lesson.Because my background is engineering. We know that in engineering, you have to strive on your own. And I always prepare them for college life especially for engineering life, because most of them will go to engineering field that is why I train them in solving.) (*Interview with Teacher B, p.39)
***

There were two emerging central foci of the shared teachers' insights. These were the emphasis on ways of improving Physics teaching and PLA administration, and values-integration. The teachers realized that longer contact time for the Physics class and stricter proctoring guidelines when administering any form of PLA must be implemented. Also, integrating values such as honesty and self-motivation, were perceived to be important for the students to succeed in their future higher education and professions. It was further expressed that encouraging self-reflection and using traditional practices such as manual writing instead of digital outputs are some ways of helping students internalize these values.

The following statements are excerpts from the interviews with teachers A and B. These are given in support of this part of the analysis.

Teacher A: *Stricter sya dapat ma'am. I-implement ang proctoring, or I mean ang mag-administer sa exam dapat istrikto, magtuyok-tuyok, or whatsoever. Para ma-avoid sya... pero sa ET (enabling task) to nahitabo ma'am. — Kung mas naging strict mi, na-avoid unta to. But what if, for example determined man ang bata. It will find ways man gyud ba. If there's a...will, there's a way. (laughs)*
—More time sa instruction ma'am, kasi limited ang time. Tapos we are to cover many topics unya maglisod ang bata mag-grasp dayon ba sa lesson kay, short lang man ang time.— If shorter time ang gihatag for seatwork, unya... wala na'y reinforcement thereafter kay, maglisod jud sila.
(It should be stricter ma'am. Implement proctoring, or I mean the one who administers an exam must be strict, roams around or whatsoever. In order to avoid... but that actually happened in an ET (enabling task) ma'am. – If we had been stricter, it must have been avoided. But what if the students are really determined. It will really find ways. If there's a...will, there's a way. (laughs) — (More time should be for the instruction, ma'am because time is limited. Then we are to cover many topics ans the students find it difficult to quickly grasp the lesson because the time is so short. — If shorter time is given for a seatwork, then... there's no reinforcement thereafter, the'd really have difficulty.) (*Interview with teacher A, p. 42-43)
***
Teacher B: *Parang, aah... self-motivation... kasi pag ang estudyante self-motivated to learn, without the presence of teacher, mag-aaral talaga. Curious talaga yan. Kaya yun dapat natin i-ano, aah, ano talaga, ma-develop sa bata yung self-motivation, kasi without the presence of theteacher talagang mag-aaral yan if alam nila kung ano yung goal nila sa life. (Teacher B talking about value –integration in his performance task of at most five hundred word problems to be solved by the students.*

(Perhaps, aah... self-motivation... because if a student is self-motivated to learn, without the presence of teacher, he/she will really study. He/She is really curious. So that's what we need to aah, to develop among the students, self-motivation, because without the presence of the teacher, he/she will really study if they know their goal in life.) (Interview with teacher B, p.40)

***

(2) *Impact of students' readiness in physics on teacher's view of teaching.* This was shared only by Teacher D. What Teacher D found signficant in his experience of PLA was the realization of the insufficient level of mathematical skills of his STEM students. He was surpised to have received questions about fundamental, if not trivial, mathematical principles. He perceived that the said mathematical principles and skills were needed to succeed in a Physics and must have been learned in the early years (Charles-Ogan, 2017).

Consequently, the teacher was shocked and frustrated. To help students succeed he realized that he had to be patient, motivate his students and help them become independent learners. As noted in the earlier parts, only Teacher D had no education degree and teacher's license. His physics content knowledge and research background in the applied physics industry, however, were relatively deeper and more comprehensive than the other three teachers.

The following excerpts are given in support of the finding that is presented here.

Teacher D: *Sa Enabling Task (ET) na gihatag naku sa ilaha one time ma'am. Problem- solving na sya tanan ma'am katong gihatag namu na first ET for the ahh.. Prelim. ---Siguro pag generate ato na exam, ok man to sya. Ok ang ET pero it turns out na ang mga bata naay difficulty in solving those problems at the allotted time. --- Ano lang sya ma'am, murag didto gyud naku sya nakita ilahang level of understanding not only sa physics but sa math. —Medyo makafeel man jud ta sa level of learning sa atong mga students no, medyo shocking lang sa akoa... mga variables ing-ana, i-transfer nimo sya... ang equation from this side to this side.. so para i-cancel nimo sya dri na side then i-transpose... basta change of variable...the basics in the math. In the level of understanding sa Dep Ed na curriculum kay pass sa algebra unya kung they ask those questions na mga basic lang, medyo lisod and shocking to... unya ET na sila unya siga na ug balik-balik.*

(In the Enabling Task (ET) that was given to them one time ma'am. It was all problem-solving that was given as the first ET for the ahh... Prelim. – Perhaps when the exam was generated, it was okay. The ET was okay but it turns out that the students had difficulty in solving those problems at the allotted time. –It's like this ma'am, it was there that I really determined their level of understanding not just in physics but also in math.—Though we really have a feel of the level of understanding of our students, but it was a bit shocking for me...the variables, you transfer it... the equation from this side to this side.. so to cancel in one side you transpose... if it's a change of variable... the basics in math.In the level of understanding in the DepEd curriculum, they passed algebra, so when they ask questions that are quite basic, it's difficult and shocking...then they're already given the ET and everything has been repeated for several times.) (*Interview with Teacher D, pp. 22-23)

***

Teacher D: *Medyo frustrating sya... wala kang choice, you need to recap katung mga algebra na mga concepts. And sayang inyong time na mabuhos unta to more sa physics kay applied na man sya. So sayang imong time magugol pero di man pud sila ka-learn kung dili nimo sila tudluan. —Ang ending, math class na sya na physics ang problem. Dapat, although dili sya ing-ana ang level pero basin unya maingon na sya ug math classes. – So ang teaching ano na... medyo challenging sya. So dapat ano lang siguro, pasensya... patient lang jud sa among part.*

(It's a bit frustrating... you have no choice, you need to recap the concepts in algebra. Your time is wasted because instead of using it for more physics because it's is already applied.So the time that you allotted there is like wasted but they cannot also learn if you do not teach them that. — In the end, it's a math class with a physics problem. – So your teaching becomes... it's challenging. So perhaps ther just have to be pateience... we just have to be really patient on our part.) (*Interview with teacher D, pp. 22-23)

***

Teacher D: *Unya more ano siguro sa ano sa learners kailangan pud nila ug more time to practice. Then usahay mangutana ko, unya medyo maglagot ko kay mo ana sila sa akoa ma'am na maghatag daw ko sa ilaha ug mga exercises para makahelp sa ilaha. Although tama man na pero akong personality man gud, di ko ganahan ug mamugus ug tao ba...na dapat draw nimo sa imong kaugalingon nya naa may library (laughs). Naa may daghan didto ug mga problems, mga ing -ana...—Ano lang gihapon gud sya, pero dapat ikaw mismo.. di na.. I don't need to give you a homework or assignment for you to solve. Tan-awon lang diay nimo imong grades, that's your motivation na. Tagilid paka unya nagapaabot paka sa akoa? Lisod na kaayo sya.* (laughs)

(The perhaps for the learners they just need more time to practice. Sometimes when I ask them, I get annoyed when they tell me to give thme more exercises that can help them. Although that is right but in my personality, I do not like forcing people.. you should draw it from yourself anyway there's the library (laughs). There's a lot of problems there, something like that. –It's really like, you yourself should... you should not be... I don't need to give you a homework or assignment for you to solve. Just look at your grades, that's your motivation already. You're about to fail and yet you're still waiting for me? That's quite difficult.) (*Interview with teacher D, p.26)

***

(3) *Impact of the tension between how PLA should be done and how it is actually done on teaching and learning.* This centrality of significance referred to the dilemma that teachers faced as they chose between what they perceived to be the best PLA and what their actual situation permitted. Teacher C expressed this kind of focus on this shared most significant story. As raised in the earlier paragraphs, Teacher C was distinct in his educational attainment of reaching the post-graduate level in physics education.

Teacher C shared that the level of engagement that he witnessed among his students as he gave a practical activity as a PLA during the early part of the schoolyear concretized his ideal Physics class scenario. The ideal process of implementing PLA was described as one where students were given the opportunity to explore, investigate and search for answers that are not pre-determined for them. On the other hand, such open-ended activities that were designed to develop the scientific and investigative skills of the students, took so much of their already limited time. As how Teacher C explained it:

> Teacher C: *Uhhh... 'Yung, the first two weeks I have with my students. When I gave them investigation. They were so engaged...Uhh. it's more of... I think it... more about measurement and... Uhh, I want them to measure a certain quantity, area... let's say area, length, a derivation of quantity. Say speed?And yahh... the length and the area, particularly on the significant figures and determining the errors... and meron pang isang task kami eh... kasi yung...that's also required in the General Physics I for them to come up with a linear fitting. It was quite fun. I mean, when I observed them they are so engaged. Because, because...walay nag-kuan, nag-yawn...*it's because.. it's... they moved...they move and they investigate. There are no specific answer and that's very good.There's no specific answers, it requires more of their investigative and common sense...ahh skills. So I think it was a very good experience for them. However, it took us a lot of time.
> (Uhh... the first two weeks that I have with my students. When I gave them investigation. They were so engaged...Uhh. it's more of... I think it... more about measurement and... Uhh, I want them to measure a certain quantity, area... let's say area, length, a derivation of quantity. Say speed?And yahh... the length and the area, particularly on the significant figures and determining the errors... and we have one more task... because the... that's also required in the General Physics I for them to come up with a linear fitting. It was quite fun. I mean, when I observed them they are so engaged. Because, because... nobody yawned... it's because.. it's... they moved...they move and they investigate. There are no specific answer and that's very good.There's no specific answers, it requires more of their investigative and common sense...ahh skills. So I think it was a very good experience for them. However, it took us a lot of time.) (*Interview with Teacher C, pp. 33-34)
> ***

The dimension of time, in addition to the number of learning competencies and skills that an existing policy was perceived to require, set the limit on how PLA could actually be done. The teacher expressed that the practical and investigative form of PLA elicited much student engagement. However, factors in the real setting hindered the teacher from doing it further. Hence, the perceived tension between the two, the ideal versus actual, was central to the significance of this shared experience. Below are Teacher C's statements regarding this.

> Teacher C: We're supposed to finish that within a week and then *nag-lag kami ng two weeks. Tapos matagal ako nag start dito mag teach kasi I'm supposed to start teaching by June five kaso na delay ako ng isang week because hindi pa ako ni-release ng dating school. So, ganun.*
> (We're supposed to finish that within a week and then we lagged by two weeks. Then I started teaching late because I'm supposed to start teaching by June five but I was delayed by one week because I was not released by my previous school yet. So, that's it.) (*Interview with Teacher C, pp. 34)
> ***
> Teacher C: Ahmm.. It's quite satisfying. If I would only decide for the coverage or the content of my... of General Physics 1, I would try to limit it only on mechanics *sana. Or tadtarin natin ang mga.. Uhhh, yung mga tasks that will apply yung mga scientific skill uhh...* science skills. Investigation.. uhh recognizing patterns...using equipment and then the basic idea of committing errors...the uncertainty of measurements.
> (Ahmm.. It's quite satisfying. If I would only decide for the coverage or the content of my... of General Physics 1, I would try to limit it only on mechanics. Or we give more emphasis on... uhh, those tasks that will apply the scientific skill uhh... science skills. Investigation.. uhh recognizing patterns...using equipment and then the basic idea of committing errors...the uncertainty of measurements.) (*Interview with Teacher C, pp. 34-35)
> ***

Teacher C revealed that he was satisfied with the level of student engagement that he witnessed when he gave a PLA that he believed to be ideal. He was also hopeful that the tension could be eased in some ways. Moreover, the corresponding insight was centered on the perceived role of teachers in the improvement of the curriculum that was viewed as being heavily congested. It was noted how the insight was focused on ways of relieving the earlier-mentioned tension in order to improve the status of Physics teaching and consequently of the students' level of Physics learning. As realized by Teacher C, his role as a teacher in the improvement of the Physics curriculum was to express calls for realistic policy reforms. Instead of too many competencies which only lead to superficial and temporary knowledge, emphasis should be on developing the necessary Physics competencies and skills for college readiness.

The teacher's deliberate choice of adhering to an existing educational policy somehow hindered him from implementing what and how PLA should be done based on his personal understanding, beliefs and experiences. This repeatedly emerged in the discussions. Hence, this was central to the teachers' conceptions of PLA.

The following excerpts are given in support of this finding.

> Teacher C: It's more of... they need to conduct... they to need conduct investigation. it might be an experimental or just simply a description or an observation as long as they use their uhh... mental skills. The problem here eventually.. we resort to calculations and we tend to be very bookish because we have to follow the CG (*curriculum guide*) and the only way I could follow the CG schedule is for me to go back to the book, *kasi andun na lahat. And then calculations lang... I mean alam ko yun it's...* because probably my brain, because I love Physics. I love doing that (*solving problems*)...but not everybody in the STEMloves doing.
> (It's more of... they need to conduct... they to need conduct investigation. it might be an experimental or just simply a description or an observation as long as they use their uhh... mental skills. The problem here eventually.. we resort to calculations and we tend to be very bookish because we have to follow the CG (curriculum guide) and the only way I could follow the CG schedule is for me to go back to the book, because everything is already there. And then it's only calculations... I mean I know that it's... because probably my brain, because I love Physics. I love doing that (solving problems)...but not everybody in the STEM loves doing.) (*Interview with Teacher C, p. 35)
> ***
> Teacher C: I think the CG has to be revisited again by the developers and it has to be.... It's very critical that we who are in the field, uhh... the Physics teachers... so we need to give the feedback to them detailed as possible. So that the developers of this CGs or in Physics particularly, will be guided on how to...on how to at least to redesign.. but be honest,I want it to have a much...much... *anong tawag nito? Aahh.. yung konti lang yung content? Pero yung depth nung pag-practice ng science and math nila ay andun.*
> (I think the CG has to be revisited again by the developers and it has to be.... It's very critical that we who are in the field, uhh... the Physics teachers... so we need to give the feedback to them detailed as possible. So that the developers of this CGs or in Physics particularly, will be guided on how to...on how to at least to redesign.. but be honest, I want it to have a much...much... what do you call it? Aahh... one with just few content? But the depth of practicing science and math is really there.) (*Interview with Teacher C, p. 35)
> ***

Students' Experiences of PLA

The students were similarly asked to narrate noteworthy stories about, as well as the reactions and insights associated with, their PLA experiences. The centrality of significance of their stories, the emotions felt and the insights they gained from their experiences are presented in Table 17.

Table 17 Centrality of Significance of Students' Lived Experiences of PLA

Centrality of Signficance	Emotions	Insights	FGD Group(s) Which Expressed the Given Experiences, Emotions and Insights
1. Impact of experience on one's grades	Nervous, anxious Disappointed, desperate, hurt, furious, guilty, stressed, hopeless, discouraged Versus Happy, relieved, fulfilled, enjoyed, amazed, excited, challenged	*Self-improvement *Values formation *Role of peers on learning	Groups A, B, C and D (Groups A and D were both from a private SHS, while Groups B and C were from a public SHS.)
2. Impact of deviating from one's usual practices on learning	Anxious, guilty, satisfied	*Role of peers on learning	Group A (With the most number of males and under the youngest and least experienced teacher, Teacher A)
3. Impact of practical PLA on students' learning	Happy, excited, frustrated	*Continuation of practical PLA *self-improvement	Groups C and D (The two groups with the most number of females and JHS awardees)

(1) *Impact of experience on one's grades*. This centrality of significance was the most common among the four FGD Groups. For the whole student sample, twenty-two out of the thirty-two students in this study, or around sixty-nine percent (69%), shared their most significant stories that were centered on the impact of the experience on their Physics grades. The students' described two opposite emotional states in their stories: moments of failure and moments of success. Some recalled

their inability to answer certain PLA items, unpreparedness, cheating and failures, while others recollected their moments of success in being able to answer the given PLA tasks, either by onself or with peers, and either honestly or otherwise. Hence, this centrality of the shared most significant experience of PLA was the general one across the two types of SHS (public and private) and regardless of the students' physics teacher profile background.

Moreover, in their stories the role of peers on learning and success or failure in PLA emerged as it did in the earlier sub-sections. This implied that the students valued the presence and role of their peers in their experiences of PLA and learning in general.

The following are excerpts from students' FGDs which show some of the shared most significant stories of the students in their experience of PLA.

From FGD Group A:

> Trish: *Ma'am akin ma'am yong isang ET ma'am one time ma'am. Ay, not sure kung*
> *ET or exam. Nag-answer gud ako ma'am tapos parang hindi ko alam na-mental block*
> *man ako, ganyan ma'am. Sige lang ako skip ma'am so hanggang na skip ko na lahat*
> *ng question ma'am, so balik-balik na ako ma'am. Parang, parang lutang gud ako*
> *masyado naga-answer ako ma'am. Pero parang nakulbaan gud ako ma'am kay kato*
> *na akong nabuhat ma'am ay makulbaan ko sa mga answeran nako, sa score na*
> *mahitabo ma'am.. naing-ato ang process sa akong pag-answer ma'am. For me*
> *ma'am significant jud to sya ky naunsa gud ko ato ma'am murag ambot! Lutang na*
> *jud ko ato ma'am na wala ko ka-advance study ato ma'am.*
> (For me ma'am it was one ET one time ma'am. Oh, not sure it it was ET or exam.
> While I was answering ma'am, then I did not know but I got mentally-blocked ma'am.
> I kept on skipping until I skipped all of the questions ma'am and I just went through it
> again and again. It was like I was just floating while answering ma'am. It was like I got
> so nervous of my answers, of what my score would be ma'am... that's the process of
> my answering. For me that was significant ma'am because I really did not know what
> happened to me at that time! I was not in the right mind because I have not studied in
> advance ma'am.) (*FGD with Group A, p.24)
> ***

From FGD Group B:

> Roel: *Katong one time ahh... naa siyay katong assessment...*quiz after discussion. *So*
> *kato kay murag wala kaayo nako na fully digest angsubject... ang topic gud maam so*
> *at that time kanang blanko jud kaayo akoang mind. Wala koy ma-answer 'tas not in*
> *good terms pajud mi sa kong seatmate (students laugh) so murag wala koy*
> *mapangutan-an kung unsay tama nga buhaton... ing-ana gud ma'am.So mao to, at*
> *the end nagpataka-taka rako'g sulat sa'kong answer didto ma'am.*
> (There was one time ahh... we had an assessment... quiz after discussion. Then I did
> not digest the subject fully... the topic ma'am so at that time my mind was totally

blank. I could not answer anyting and the worse was that I was not in good terms with my seatmate at that time (students laugh) so I had no one to ask on what to do... that was it ma'am. So at the end I just answered it without thinking at all.)(*FGD with Group B, p.46)
***

From FGD Group C:

Luane: *Ano ma'am katong first set sa problem-solving na individual ma'am na daghan kaayo. Hahaha! 105 items nga mga 10 ata ka problems. Ano ma'am kanang 7:20 p.m. nato ma'am... kanang dismissal nato namo niya wala pako ka answer ma'am (students laugh). Ang akoang lasi resort kay nangopya nalang ko ma'am bisag wala ko kasabot. Hahaha!— Ano ma'am sa last part naman ko nangopya, perfect pud lage ko. (students laughing).— Na-realize nako ma'am na dili jud sayon.. hmmm.. hahaha! Murag na-konsensya pud ko ato ma'am, kanang ano ma'am wala baya jud ko nagapangopya ma'am kato lang jud na time. Murag na-konsensya ko ato. Dili na jud ko mousab, hahaha!*
(The first individual problem-solving that was quite long ma'am. Hahaha! 105 items with 10 problems. It was already 7:20 p.m. at that time ma'am... it was almost dismissal but I still din't have any answer ma'am (students laugh). My last resort then ma'am was to copy even if I did not understand. Hahaha! — I only copied at the last part ma'am, and I got perfect (students laughing). — I realized ma'a that is wasn't really easy ma'am.. hmmm...hahaha! I felt a bit guilty at that time ma'am, it was actually just that time that I cheated ma'am.I resented it. I won't do that again, hahaha!) (*FGD with Group C, pp.50-51)
***

From FGD Group D:

Matt: *Ang.. in short kay I'm very happy with it. Significant sya kasi first time ko yon na E.T sa physics subject kasi sa Junior High na Physics kasi wala man toy tarong uy! So sa... ito kay parang yung feeling gud na ma answeran mo yung isang certain questions na without any problems gud. Wala...walang nag-hinder sa'yo na dire-diretso mo lang.. so yon.*
(In short I'm very happy with it. It was significant because it was my first ET in phiysics subject because in Junior High Physics, it was not that in place. So in the... the feeling when you are able to answer certain questions without any problems. Nothing... nothing hinders you and you just go about it easily... so that's it.) (*FGD with Group D, p.33)
***

The value of attaining high grades was evident in the students' utterances and expressions Emotions like being happy, relieved, fulfilled, enjoyed, amazed, excited and challenged were expressed to have been felt in their moments of success in PLA. On the other hand, they were nervous, anxious, disappointed, desperate, hurt, furious, guilty, stressed, hopeless and discouraged in their moments of failure. The experiences gave them insights into the need to improve one's performance in PLA and reflect on one's values.

The following excerpts are given in support of this finding.

From FGD Group A:

Deo: *Mag-ampo jud ma'am, ano ma'am when you take exams, assessment ma'am, we should be ready, relaxed and ano ma'am.. ako man gud ma'am nagstudy hard man gud ko ato ma'am, dapat pala don't study hard, study smart. — Ano ma'am like i-ano mo ma'am i- grasp mo lahat na-study mo, like hindi mo lang sya dapat i-ano, 'yang hardworking ka masyado ba tapos sa end pala ky maano lang pala, so dapat i-familiarize mo sya, hindi lang mo sya imemorize.*
(To really pray ma'am when you take exams, assessments ma'am, we should be ready, relaxed and... i really study hard ma'am, but I realized that I should not study hard, study smart instead. — It's like you graps everything that you have studied, you just do not, you may be too hardworking but in the end you might just lose it, so you should familiarize and not just memorize.) (*FGD with Group A, p.24)
***

From FGD Group B:

Harry: *Without kanang walay help gud sa uban ma'am. Kanang na-test jud nako murag kaya man jud nako diay. Kanang dili gud mangopya man o di mag ano sa uban maam ba magsalig.*
(Without any help from others ma'am. I have really tested that I can really do it. Without cheating or depending on others ma'am.) (*FGD with Group B, p.43)
***

Lexy: *Kanang ano ma'am, kanang dili jud diay na, it's not the about subject.. ahh lage ma'am. It's not about the subject, kanang about na sa imuhang sarili kung... — kung willing ba ka maminaw. Kay kung bisag maminaw ka ma'am tapos di man diay ka willing, kanang murag pagawas lang nimo, wala lang gihapon, useless lang gihapon. Dapat kay... tapos mahimo pud, kanang resourceful gani, mangita siya'g way. Daghan pajud diay kaayo siya'g ways para ma ano ma-solve nimo ang isa ka problem.*
(It's like this ma'am, it's not really about the subject... yes ma'am. It's not about the subject, it's about yourself...— if you are willing to listen. Because even if you listen ma'am but you are not willing, like you just let it pass through the other ear, it's nothing, it's still useless. It should be... one should be resourceful in looking for ways. There are so many ways to solve a problem.) (*FGD with Group B, pp.43-44)
***

From FGD Group C:

Ninna: *Wala man gud nako to gipaglaban ma'am. So sunod ma'am kay dapat ipaglaban, haha! (students laugh) . —Kanang ipaglaban nako ang answer ma'am na kani lang man gud ang akong nasabtan sa problem so kani akoang way sa pag solve, unta ireconsider ba nga ano gud...— wala ko nagsulti ma'am. Murag ana ko, "sige nalang ui", ana gud ma'am.. bisag sa akong sarili ma'am nasakitan ko, naiain ko.*
(I did not fight for it ma'am. So next time, it has to be fought, haha! —I should have fought for my answer ma'am and explain that it was the way I understood the problem so that was the way I solved, I hope it would be reconsidered...— I did not explain anymore ma'am. I though, "just let it be", something like that ma'am.. but for myself I was hurt, I was offended.) (*FGD with Group C, p.53)
***

From FGD Group D:

Maine: *Yon pagka-ano for.. don ko ano.. na-realize na ano pala talaga... mas better, mas ano sa feeling ba na, "ah nabagsak lagi ako, so kaya ko pa man magbawi for the next ano". 'Tas don ko na... na-ano talaga na mas ok tong ganito, kahit ganito ang score, like sakit parin.. sakit gud sya Miss na ano.. na ing-ani lang akong score 'tas ET (enabling task) gud sya so... like pila sya ka percent sa grade. So pag... pero at*

least, na-realize ko na mas better ang ganito na ano... ganito ang score para alam ko na hindi ako nag-ano gud.. hindi ako nag-cheat para maka-ano... so like yah.
(The time came when I realized that... it would be better, better in the feeling that, "yes I failed, but I can still do better next time". Then I realized that... it's better like this, even if the score is just this, like it still hurts... it hurts Miss that... my score is low and that it was an ET so... it covers big percent in the grade. So when... but at least, I realized that it's better this way... my score is just this but I know that I did not... I did not cheat just to get... so like yah.) (*FGD with Group D, p.32)
***

(2) *Impact of deviating from one's usual practices on learning.* One student (male, scholar, and JHS awardee from FGD Group A) out of the thirty-two shared another distinct story about his experience of PLA which stood out as most significant. Central to considering the story as most significant was the effect of his choice to deviate from his usual practice of studying by himself to studying with others on his learning. The said experience was valued by the student as most significant because it was the first time that he opted not to follow his personal norm of studying and preparing for a major examination. His utterances implied that his peers had a big role in influencing him to do an unlikely decision of giving in to his classmates' invitation and request of studying with them and in a coffee shop, a place which he viewed as an unusual place to study.

The decision to deviate instead from his personal norm resulted to the student feeling anxious of the uncertainty that it might bring. Feelings of guilt and annoyance with oneself for giving in to his peers' request were felt as the said experience unfolded. However, the feeling of satisfaction was felt as the product of his deviation turned out to be a success. Success was seen to be measured by the high score that he got in their physics exam after their group study. The student also realized that one could actually learn by teaching others. This showed that peers were seen to play signficant role in the learning of students (Vygotsky, 1989). The said student in who shared this experience of PLA further expressed that his peers were the major force that drove him to either stick to his personally established norms of studying or to give in and deviate from it.

The following excerpts are given in support of the finding presented here.

> Vens: *It is when the night before the examination of the physics ma'am, that is when first time I studied in a coffee shop with my friends.. first time. Dalawa sila ma'am, first time, grade twelve. ---Because ma'am ana man sila ma'am, giinvite lang ko nila ky magpatudlo daw sila. --wala ko ka-study ma'am sa akong self ato na time ma'am. Anxious na kaayo ko nganong wala ko ka-study tungod ato nila, lagot kayo ko!--- Guilty ko sa akong sarili ma'am kay wala ko ka-study kay kuan... anad man ko ma'am nga naga-study ko sa akong sarili labi na akong math kay dili ko ka-focus.--- Kuan ma'am satisfied kay successful sya sa akong part ky dili sila mabagsak ma'am, kanang ana na part ma'am tapos ang result sa akong exam ma'am ky naging highest man sad ko ma'am.--- Aah... kuan siguro ma'am, teaching is a way of learning. Abi nako wala ko katuon kay nagtudlo ko sa uban, pero ang ending, nakatuon diay ko.*
> (It is when the night before the examination of the physics ma'am, that is when first time I studied in a coffee shop with my friends.. first time. They were two ma'am, first time, grade twelve.--- Because they said ma'am, they invited me because they wanted to be taught.---I hadn't studied by myelf at that time time. I was quite anxious that I was not able to study because... I'm sued to studying by myself only ma'am specially in math because I cannot focus. --- It's like I'm satisfied ma'am because it was successful in my part because they did not faile ma'am and then the result of my exam ma'am, I was the highest anyway ma'am.--- Aah.. perhaps ma'am, teaching is a way of learning. I thought I was not able to study because I was teaching others, but in the end, I still learned.) (*FGD with Group A, pp.26-27)
> ***

(3) *Impact of practical PLA on students' learning.* When asked to reflect on their experiences of PLA and choose which among them was the most significant, students from FGD Group C and D cited their practical PLA. Based on their profile characteristics, Group C was from a public SHS and was under Teacher C who was the sole teacher who had a PhD level in physics education. Group D, on the other hand, was from a private SHS and the only group whose physics teacher was non-license holder but the only one with Applied Phyiscs degree and research experience.

Practical forms of PLA, according to the students from Groups C and D, included laboratory activities and other tasks that required the students to do practical applications of their Physics learning. In their stories students talked about positive emotions like being happy, excited and challenged while others were about negative ones like disappointment and frustration. The evoked emotions depended on how the said experience affected their learning or desire to learn.

The positive emotions were felt by those who viewed their experiences with practical forms of PLA as meaningful. These students decscribed their experience of practical PLA as pleasant and helpful in making them understand and appreciate Physics more. For those who believed that their practical PLA could have been maximized more, negative emotions toward the experience were felt. They remarked that the way their practical PLA was done did not reach the potential of the said PLA form in bringing about deep Physics understanding among the students. Those who deemed that their practical PLA experience was fruitful and pleasant, favored its continuation and those who found it otherwise, realized the need to increase their efforts in studying.

It was shown in this part of the finding that students equated deeper Physics understanding and learning to implementing practical forms of PLA that encouraged interactivity among students and open-endedness in the search for answers (Laurillard et al, 2013). This was also seen to emerge in the insights of the teachers that were discussed in the earlier parts (see discussion of the third entry of Table 16).

The following excerpts are given in support of the analysis that is discussed in this part of the study.

From FGD Group C:

> Danna: *Na-mention man siya ni Ninna ganina ma'am katong murag i-explain namo sa Grade 6 students tong conservative ug non-conservative forces. —murag mas napuga ata among utok ato kaysa sa kanang solving-solving. Murag maghuna-huna ka, "ha? Nakasabot ba diay ang bata ani?"— so murag ma-test jud nimo imohang learning. —Murag kanang labad jud kaayo akong ulo ato ma'am, hehe!—Na-excite ko na murag challenging man gud siya ma'am nga.. na mapasabot nimo sa Grade 6 students.. —Dapat ipadayon ang mga ing-ana na kuan ma'am — Kay kung mabalik sa basic ang kuan, so meaning nakasabot jud ka sa lessons.*
> (This was mentioned by Ninna earlier ma'am where we explained to the grade 6 students the conservative and non-conservative forces.— It's like our brains were

squeezed more on that than when solving. You would really think deeply like, "what? Did the kids really understood this?" — So you can really test your learning. — My head was really hurt at that time ma'am, hehe!— I was excited and it was challenging ma'am to... let the Grade 6 students understand it.. – That kind should be continued ma'am — because if you can go back to the basic, it means that you really understood the lessons.) (*FGD with Group C, pp.45-46)

***

Luke: *Parang yong.. actually parang yun yong parang first performance task.. ay dili man to performance... ay task ni sir sa amoa na murag wala pud siya ato for three days, two days.. So, basta mao to na week wala siya then mao tong task na gibilin.— tung mag measure mi ug height three times 'tas weight three times then ang... Ay! wala diay apil ang weight uy! Then, ang last ato is tong — tung speed sa isa ka tao. So mura mi'g tanga sa Senior High building ma'am sa gawas sa corridor.. sa corridor na nagdala-dala mi ug meter stick nag measure mig 0-20 meters then pabalik mura mig tanga didto ma'am kay for... — murag sa among part ma'am kay lingaw man siya kay ang uban... kay ang uban, kay sa isa ka teacher na class parang nakalingkod lang sila — niya kami nagbaktas-baktas, so saba kaayo mi. Human sila natingala sila sa amu-a.—Lingaw siya ma'am...—Happy ma'am kay ano siya interactive, hehe! Kase yun yung point, so yun ma'am.*

(Perhaps the... actually it was the first performance task.. no it was not performance... it was a task from Sir for us when he was absent for three days, two days.. So, it was a taaks that was left to us that week. – It was when we were asked to measure height three times then the weight three times then... Oh! Weight was not included! Then the last one is... the speed of a person. So we looked like fools at the corridors of the Senior High building ma'am.. we were carrying meterstick in the corridor and we measured 0-20 mteres then going back we were like fools there ma'am because...— but in our part ma'am it was actually fun because compared to others... a class of one teacher at that time was just seated — while we are outside walking, so noisy. They were wondering what we were doing.—It was really fun ma'am...— Happy ma'am because it was interactive, hehe! Because that was the point, so that's it ma'am.) (*FGD with Group C, pp.48-49)

***

From FGD Group D:

Romel: *Ang pinaka significant jud sa akoa katong duha ka lab activities... kay didto man jud nako na experience on hand...—na-experience nato, na-apply nato, nag... naghimo ta'g observations, calculations based on the events nakit-an nato, so mao to... —feeling nako kay happy ko kay ano... medyo practical man gud pud sya in a way. Though dili kaayo bigatin sya pero at least naa mi ato... naa mi activities na kanang naa dyuy mga gamit... tapos ang akong insight atong kay ano.. ahhmm.. dapat sa mga activities na ginahimo namo sa sa school kay i-treasure jud namo Ma'am... i.. ahmm.. tilukon namo unsay meaning, unsay significance ato sa among learning Ma'am.*

(The most significant for me are the two lab activities... because that is where I experienced on hand..— We experienced, we applied... we made observations, calculations based on the events that we saw, so that's it...— My feeling was being happy because... it was a bit practical in that way. Though it was not really sophisticated but at least we had it... we had activities which had materials... then my insight in that is..ahmm.. we should treasure the activities that we do in school ma'am.. I.. ahmm... to cherish the meaning, what its significance is to our learning ma'am.) (*FGD with Group D, pp.30-31)

***

Ella: *Ah.. lab.. nag-lab kami tapos yang given lang ang mga equations tapos substitute- substitute tapos ganyan. Tapos sabi ko, o nakuha ko ang answer pero hindi ako satisfy kasi hindi ko talaga alam bakit ko ginamit itong equation. Gusto ko malaman bakit meron dito kunwari bakit may "pie" ditto? Bakit dito may "2" ganyan-ganyan? Bakit naging constant si ganyan tapos yon. Tapos significant sya sa akin kasi ano, don ko nalaman na hindi ako magtamad. Kailangan ko.. gusto ko yung... gusto ko malaman dapat I need to go deeper kasi... parang ako kasi hindi ako* *dependent sa mga formula. Sometimes gusto ko na through that question ako mismo maka-come up ako sa formula kasi magawa mo man talaga sya if you have the basics gud and alam mo talaga yung problem ganun. So a bit frustrated, something like that, kasi nag lab na sana parang wala lang, sayang.. something like that.*

(Ah.. lab.. we had lab then the equations are just given and then it was merely substitutions. So i said, yes I already got the answer but I was not satisfied because I really did not know why I used this equation. I wanted to know like why there's "pi" (π) here? Why is there "2"? Why is this one constant and that. That was significant to me because I realized there that I am not lazy. I need to... I wanted to know so I need to go deeper because.. I'm not dependent on the formula. Somewtimes I prefer that through that question, I myself can come up with the formula because you can really do it if you have the basics and when you really know the problem, like that. So a bit frustrated, something like that, because there was already a lab but it was like nothing, wasted.. something like that.) (*FGD with Group D, pp.34)

***

Teachers' and Students' Categories of Description of PLA

Research question number four asked for the teachers' and students' categories of description of PLA. This is one of the two ultimate goals of this phenomenographic study. The different statements describing the teachers' and students' ways of understanding PLA, their beliefs about the effectiveness and efficiency of PLA and the centrality of significance of their lived PLA experiences that resulted from the analysis of the transcriptions of teacher interviews and FGD (Tables 6-17) were categorized base on the similarities in focal awareness expressed therein. Statements with similar themes in focal awareness form a category. The researcher determined the main theme of a category and called it focus of conception. A focus of conception collectively represented the emerging aspects in focal awareness in the teachers' and students' ways of understanding, beliefs and experiences of PLA. Hence the focus of conception distinguished a category of description from the other categories. Each category of description represented one way of conception of PLA. The researcher further gave a descriptive label that highlighted the focal point of a category of description.

A metaphorical name was assigned to each category of description of PLA to present an imagery of a teacher or student group who had such conception of PLA.

This was also descriptive of the focus of conception which characterized a certain category of conception. There are no established and published guidelines on how to determine and assign metaphorical names to categories of description in phenomenographic analysis. In this study, however, the researcher contemplated on appropriate imageries which captured the focus of conception of a category of description.

Teachers' Categories of Description of PLA

Table 18 presents the teachers' three categories of description, the corresponding metaphorical names, focus of conception and the teacher(s) who expressed such conception(s). Based on the researcher's analysis, each teacher was seen to express more than one categories of description of PLA at the same time. However, there was one category of description which emerged as the most dominant in his awareness while the other one was less dominant. This resonated with Keys and Bryan (2001) whose study emphasized that teachers hold a spectrum or continuum of overlapping conceptions instead of a singular distinct one.

Table 18 Teachers' Categories of Descriptions of PLA

Categories of Description: (Conception of PLA is:)	Metaphorical Name	Focus of Conception	Teacher(s) Who Belonged to the Given Category of Description of PLA
1.Structural	*"Law Abider"*	PLA as the deliberate choice of adhering to an existing educational structure or policy	Teachers A, B, and C (All three had formal educational training and professional teacher's license.)
2.Practical	*"Scientist-At-Heart"*	Practical applications of PLA where students are provided opportunities for open-ended scientific and investigative activities	Teacher D (The only one with Applied Physics degree and industry research experience; the only one without a teacher's license)
3.Reflective	*"The Conscientious"*	Reflective aspect of PLA where self-reflection on the part of the teachers and students are geared towards self and system improvement.	Teachers A, B, C and D (Teachers A and D were from a private SHS while Teachers B and C were from a public SHS.)

Category 1 Structural Conception: *"Law Abider"*

The following statements constituted Category 1, the structural conception.

1. PLA is a cyclic procedure outlined in the curriculum guide done by teachers to measure students' understanding in Physics.

2. PLA is through performance tasks which address the purpose of an educational reform.

3. PLA is designed to measure how much is learned or not learned with respect to a government-given curriculum guide.

4. PLA is a cyclic process with the following steps: (i) identifying the objectives of the lesson, (ii) using teaching strategies, and (iii) giving of assessments.

5. PLA is given in fulfillment of teacher's responsibility of giving assessments.

6. PLA is effective when it is aligned with the existing curriculum guide.

7. PLA is efficient when the students' scores are high.

8. PLA is efficient when the rate of teaching the required learning competencies is high.

9. PLA is efficient when it is time-saving.

The researcher assigned the label, "structural" to describe the teachers' conception of PLA that was focused on an existing educational policy or guideline. In this study, it was in a form of a curriculum guide issued by DepEd to the basic education sector. As a structure, the said guideline listed the learning standards set by the government. These learning standards consisted of the contents or topics to cover and learning competencies that students must achieve in a subject or discipline such as general physics 1 in this study. The researcher also assigned the metaphorical name, "law abider" to this category of description to characterize the teachers who place the curriculum guide at the center of their conception of PLA.

The "law abider" is the lowest level or the farthest from being social constructivist among the categories of teachers' PLA conception as it is deliberately focused on adhering to an existing educational structure or policy. The meaning, purpose and process of PLA, the beliefs about PLA effectiveness and efficiency and the centrality of significance of the shared significant stories were greatly shaped and influenced by how the teachers valued and abided by the curriculum guide and the assessment structure that were given to them. These existing educational policies limited the way the teachers viewed what and how PLA should be. Although teachers expressed the ideal PLA that they wished to implement, adherence to the existing policies implicitly and explicitly emerged in their utterances.

Moreover, in this kind of conception, the effectiveness of PLA was determined based on how aligned a certain PLA form was to the set standards of an existing policy. An aligned PLA was considered effective and efficient.

The beliefs that PLA efficiency depended on the rate of covering or teaching the required learning competencies and the time that was saved by the teacher in designing and checking a PLA were at the center of the teachers' awareness. Teachers expressed the influence of an existing policy on the kind of PLA that they implemented. They admitted that they tended to go back to the traditional way of instruction and PLA because students needed to achieve learning competencies set by the curriculum guide. This showed that teachers' belief about PLA efficiency was based on their ability to cover as much required content as they could within a limited time. Using readily-available PLA sources such as downloadable electronic Physics books saves them time hence, believed to be helpful in achieving PLA efficiency.

Also under this simplistic conception was the understanding that high PLA scores directly indicated effectiveness and efficiency of PLA and effectiveness of instruction. This view of the direct relationship of test scores with the effectiveness of instruction was deemed problematic (Abell & Volkmann, 2006; Brickhouse, 2006).

Another naive and structural focal awareness was the understanding that the purpose of giving PLA was to fulfill a fundamental responsibility of teachers. Hence, giving of tests and grading students were things that had to be done as these were cultural practices. This view implied a naïve epistemic view of the purpose of assessment (Aydeniz, 2007). This also corresponded to what Gipps (1999) referred to as traditional assessment where "the relationship between teacher and student is a hierarchical one. The teacher sets and defines the task and determines its evaluation. The student's role is to be the object of this activity and, through the completion of a range of tests, to be graded".

This category of description echoed Aydeniz's (2007) view that "although the political and cultural structures of the school system influence what teachers teach in science classrooms and how they go about assessing students' learning in science, the fundamental challenge to the implementation of assessment reform in science classroom is teachers' naïve pedagogical content knowledge (PCK) base." This structural conception implied a naive view of PLA, because assessment was considered as a means-to-an-end and structured view that was greatly dependent on adhering to an exisitng educational policy or structure.

In other words, there was an ever-present tension between what teachers wished to do in responding to the actual assessment needs of their students (Torrance and Pryor, 1998) and their "strategic sensitivity and vulnerability to power, politics and culture that influence their instructional and assessment decisions" (Aydeniz, 2007; Delandshere, 2002; Moore, 2004). And very often, teachers submitted to the demands of an existing educational administrative structure that was in power and continued with the usual traditional, teacher-centered PLA which primarily focused on students' grades.

Analysis showed that Teachers A, B and C had this kind of category of description of PLA as their dominant conception. As mentioned earlier in this chapter, Teacher A was from a private SHS (School Y), the youngest among the four teachers and was still on his second year of teaching during the conduct of this study. Teacher A's frequent utterances that implied his structural conception of PLA were focused on the following aspects: (1) the curriculum guide as the ultimate basis of his personal understanding of the meaning, purpose and process of PLA; (2)

effective and efficient PLA result to high scores; (3) PLA scores and physics grades are direct indicators of students' Physics learning; and (4) PLA is given to fulfill a teachers' fundamental responsibility of making grades.

Teachers B and C, on the other hand, were both from the public SHS (School X) and have been teaching longer than the two teachers from the private SHS (School Y). They both were involved in giving Physics content trainings to the SHS science teachers in their school district concurrent with this study. Distinct to Teacher B's structural conception of PLA was his understanding that PLA is effective if it is aligned with the curriculum guide especially on the giving of performance tasks. In Teacher B's utterances, although he talked about giving performance tasks for the students to reach the 'creating' level, the highest level in the Revised Bloom's taxonomy of thinking skills, the main purpose of giving it was still centered on the his goal of fulfilling the requirement of an existing policy. Teacher B shared the following in support of this finding:

> Teacher B: Another is, for performance task . if... if... aah, if the students, if the output of the students, of course, follow the rubrics, ibig sabihin nasabtan nila and of course in quarterly exam of course if they got aah, high score, therefore, that is aah, an indicator that the assessment is good. If those things are present there, it means that that assessment is aligned with the objectives, competencies and educational standards based on the learning guide by DepEd. (*Interview with Teacher B, p. 28)
>
> ***

Teacher C's dominant conception of PLA was also structural as he generally believed that an existing curriculum guide set the limits of designing the kind and type of PLA that he could give to his students. This aspect of the structural conception of PLA emerged as distinct to Teacher C. Similar to Teacher B, Teacher C aimed at teaching or covering as much topics as he could in order to fulfill what the curriculum guide was believed to require.

Category 2 Practical Conception: *"Scientist-at-Heart"*

The following statements comprised the practical category of description.

1. PLA is a test of how much a student understands in Physics and is best done through laboratory experiments.
2. PLA is given to measure students' understanding, performance and skills in Physics.
3. PLA starts in using students' experiences in a teacher's lecture, proceeds to giving of written works and practical applications.
4. PLA is effective when it draws out the actual level of understanding of a student.
5. PLA effectiveness supersedes PLA efficiency in terms of the level of competencies that it assesses.

The second teachers' category of description of PLA was labeled by the researcher as the "practical" conception of PLA to emphasize that the focal point of conception was the practical, real-life aspect of PLA. The assigned metaphorical name, "scientist-at-heart", further captured the focus of this category which was to provide students with opportunities to do open- ended and investigative activities. The meaning, purpose, and process of PLA and the beliefs on PLA effectiveness and efficiency were generally centered on the practical applications of students' Physics learning and of the teacher's practices of PLA. The practical applications included PLA tasks that yielded outputs that showcased students' ability to apply Physics concepts in personal and real-life experiences of the physical world.

Moreover, the emphasis of this conception was on the teacher's deliberate effort of using the actual and personal experiences of the students of the physical world as springboard for his instruction so that students see the connection between the Physics lesson and their practical lives. Although developing the students' analytical skills through defined and structured word problems were still included in the PLA of this conception, the problems given involved the practical applications of the concepts to simulate how practising scientists search for answers to real-life queries about relationships between physical quantities, and problem-solving focused on developing the students' ability to derive, prove and establish relationships among variables.

This conception emphasized open-ended laboratory experiment as an example of an effective PLA. An effective PLA was viewed as one that was able to determine students' actual level of practical Physics learning. Open-ended laboratory experiments were deemed effective as they required students to articulate by themselves the problems or questions about the physical world that they wished to solve or answer thereby, simulating the real lives of scientists. Students had to be provided with the needed tools and equipment and be allowed to manipulate these and devise their own experiments just like how real-life scientists do in normal science.

This category of description of PLA emerged as distinct only to Teacher D. This was his dominant conception of PLA as evident by his repeated emphasis on the practical aspect of PLA as he gave his understanding, beliefs about and experience of his most significant story of PLA. As mentioned earlier in this chapter, Teacher D was from a private SHS and was the only teacher in this study who did not have a formal education training, not a licensed professional teacher and with an industry experience in applied physics research before teaching in the SHS.

The practical category of description of PLA is considered to be wider, deeper and more social constructivist in perspective and approach compared to the structural conception because it includes more than the mandated structure of implementing PLA. Their similarity is that the teacher with these conceptions of PLA had the tendency to go back to the traditional way of PLA due to time constraint. This was shown in the kind of laboratory activities that Teacher D actually did in his class which he described as 'ready-made' because the open-endedness was taken over by the structured and pre-determined procedure of searching for answers. This was also seen by the researcher in the document analysis of the laboratory sheet that was shared by Teacher A who was from same school as Teacher D. The activity was more of theory validation. Complete steps on how to go about the activity and what needed to be answered were all given in the popsheet. Tables for data presentation were also readily given, hence, the students were simply to fill these in during the labroatory session. Teacher D described this further as a kind of laboratory activity where real fun was taken out of it. On the lighter side, Teacher D expressed maximizing this practical aspect of his PLA by encouraging his students to discuss, debate and work together in working on their laboratory reports. When asked how his students were doing in their laboratory class, here is an exerpt from Teacher D's reply:

> Teacher D: *Dili kayo ma'am when it comes to the analysis but it's ok kay first paman to sya. Pero I think that's one of the drawback pud kasi I emphasize na ganahan ko sa experiment pero we know na meron pang mga close ug open-ended na mga experiments,okay… for example sa atong lab man gud medyo ano, naa tay pop sheet, then we do the thing na recipe sya. Medyo ok sya, dali sya humanon, pero for me you're taking the fun out of it.*
> (Not much ma'am when it comes to analysis but it's okay since it was just the first time. But I think that's one of the drawback, too because I emphasize that I prefer the experiment, however, we know that there are close and open-ended experiments, okay... in our lab for example ma'am, we have pop sheet, then we do the thing like a recipe. It's a bit okay, it's easy to finish, but for me you're taking the fun out of it.) (*Interview with teacher D, p.15)
> ***

Cateory 3 Reflective Conception: *"Conscientious"*

The following sentences belong to the category labeled Reflective.

1. PLA is given to prompt the students of their learning goals.

2. PLA is given to measure the effectiveness of a teacher's teaching strategy.

3. PLA is given to prepare the students for college.

4. PLA includes career guidance for students' self-assessment.

5. PLA must include assessment of students' level of engagement.

6. PLA is effective when it has provision for continuous feedback-giving to students.

7. PLA story is significant as it centers on the impact of the experience on the lives of students after SHS.

8. PLA story is significant as it centers on the impact of the tension between how PLA should be done and how it is actually be done on teaching and learning.

This category was labeled "reflective" conception of PLA to highlight the focus on self-reflection. Teachers' self-reflection that was geared towards self and system improvement was seen to be at the core of this conception of PLA. The perceived intention of teacher's self-reflection was to evaluate the effectiveness of one's instruction in terms of students' Physics learning. Because the teachers' concern was doing something correctly and appropriately, the researcher assigned the metaphorical names, "*conscientious*".

The meaning of the word 'reflective' that was adopted in this study focused mainly on the teacher's deliberate inclusion of self-reflection in PLA which required him or her to make judgements based on personal criteria of what was right and wrong, appropriate and otherwise. While Dumford et al (2015) used the framework of higher order learning skills of the Revised Bloom's Taxonomy (RBT) as separate and distinct from deep approach learning, this study described reflective conception that was parallel to the evaluating level of RBT.

It also considered the emotional and social impact of feedback on the students (Clements and MacDonald,1996), aspects that could only be discerned through a conscientious reflection of the formal and informal PLA data that represented students' level of Physics learning. This conception resonated with Nicol and Macfarlane-Dick's (2006) seven principles that make effective feedback and learning. The said principles are: (1) Feedback gives clear description of what a good performance is; (2) encourages the habit of self-assessment or reflection in one's learning; (3) provides students with clear and concise information about their learning; (4) promotes dialogue between teachers and peers; (5) supports self-esteem and motivational beliefs; (6) enables students to connect their current performance to what is optimal; and (7) provides teachers with significant information to adjust teaching (Nicol and Macfarlane-Dick, 2006).

Another result of the self-reflection among teachers was the decision to include informal career guidance as early as the students' first step into the STEM strand in senior high school. This has a future dimension as teachers reflect on best ways to prepare the students for their tertiary education and later in their professional lives. Indeed, the products of this reflective conception were plans of action that the teachers took to improve their level of instruction and thereby, improve their students' learning and the whole system of PLA.

The teachers also reflected on the meaning and significance of informal and qualitative PLA data such as observations on students' participation in and outside of the Physics class. Such data were used in determining the students' level of engagement. This was viewed as equally important as their formal PLA scores and grades (Yair, 2000). Consequently, the product of this self-reflection enabled the teacher to respond to whatever was needed for the students to be engaged.

With the earlier-mentioned centralities of the reflective conception, it was found that values-integration among the teachers and students was seen to be inevitable in science education, specifically in Physics. This resonated with some studies which argued that teaching morals, ethics and character education is a favored inclusion in the science curriculum by majority of teachers (Althof & Berkowitz, 2006; Anderson, 2000; Kang & Glassman, 2010). As teachers viewed PLA and their experiences of it as an on-going reflection that was geared towards improvement, values such as self-motivation, perseverance and honesty were seen to emerge. Teachers in this conception of PLA implied that the teaching of values to their students was part of their role as a teacher. Hence, it was included in their instruction and PLA. The values that the teachers believed important to develop and reinforce among their students also reflected their personal principles and convictions. This resonated with Chowdhury's description of a teacher as a "moral person engaged in ethical teaching through professional conduct and, as a moral educator who teaches students with the same core values and principles that he or she strives to uphold in practice" (Chowdhury, 2016 citing Campbell, 2003).

Furthermore, values-integration requires a high-order thinking skill of evaluation where an individual "makes judgement based on criteria and standards" (Anderson & Krathwohl, 2001). The teachers' personal principles and convictions served as the criteria and standards as they judged on what values to teach and reinforce among their students (Chowdhury, 2016). Therefore, this reflective conception of PLA overarched the structural and practical conceptions of PLA. As teachers were faced with an external policy and resources that may seem to limit them, the reflective conception allowed them to reflect and judge how else to maximize their Physics instruction and PLA situations that they were in. Hence, this conception superseded the other two.

It was revealed by the analysis that the four teachers in this study shared this conception in one way or another but only as the less dominant conception of PLA. Analysis showed that no single teacher in this study had this category of description of PLA as his dominant conception. This means that self-reflection as an aspect of PLA came only next to the other conceptions in its frequency of emergence among teachers' shared personal accounts and utterances. Each of the four teachers had a certain understanding, belief or experience of PLA that appeared to characterize the reflective conception.

The distinct aspect in the reflective conception of PLA was the conscious effort to constinuously reflect on how to best help the students. By considering their students' future, teachers viewed PLA in this category as one of the ways to prepare the students to become competent, self-motivated, persevering and honest. These values were deemed important for their future. Teacher A expressed this in his shared story of his most significant experience of PLA where he enouraged his classes to reflect on the right thing to do after getting involved in a massive cheating in their physics class. Teacher B's subtle reflective conception of PLA was seen in his self-initiated career guidance that he offered to Grade 11 students who wished to enter the STEM strand. Values such as self-motivation and perseverance were integrated in this informal PLA. Teacher C was also seen to display reflective conception in his belief that he must continually reflect on his students' level of engagement in PLA and learning in general. He believed that self-reflection could help him evaluate, judge and decide on what responses are appropriate for a certain level of engagement. Finally, for Teacher D, self-reflection was also believed to be helpful in thinking of ways to better help his students in their Physics learning. This also included encouraging the students to develop scientific values such as self-motivation.

This never-ending task of self-reflection by teachers in the context of assessment was also raised by Gipps (1999, citing Sadler, 1998). He pointed out that one of the things that teachers commonly bring to the assessment setting were their "evaluative skills in making judgements about students performance" (Gipps, 1999 citing Sadler, 1998). In this study, the teachers' evaluative skills were believed to be geared towards helping the students develop important values and succeed in physics and their future lives in college and beyond.

The following are selected excerpts in support of this part of the analysis.

> Teacher A: *Na gina-ingon na lang nako ma'am na kanang, when you go out, kung, from school, di ba? Sa engineer man to akoa, mga pre-engineering po. Daghan mga cases sa engineers na kanang mga corrupt, they don't aah, rep... report the exact amount that they buy for their constructional materials... mga ana. Gipa-reflect... tama ba na sya? Mga ana gud. Na, you don't have the right to say that the government is corrupt, because if you reflect on yourself, corrupt man pud ka in a way na naga-cheat man ka. Ana gud.*
> (I just tell them ma'am that when you go out, let's say from school, right? Mine is the engineer ma'am, the pre-engineering. There are several cases where engineers are corrupt, they don't aah... report the exactamount that they buy for their constructional materials... things like that. I ask them to reflect... is that right? Something like that. You don't have the right to say that the government is corrupt, because if you reflect on yourself, you're also corrupt when you cheat. Something like that.) (*Interview with Teacher A, p. 41, discussing how he has handled the massive cheating involving his students)
> ***
> Teacher D: So in a way, I teach them self-motivation...*na kung gusto nimo, naa may paagi, ayaw na paghulat sa uban. Kay akong principles pud ba as a person na dapat self-motivated ka. You don't need external factors to propel your self na mo-ignite...kay wala. There's no one that could help you in this world but yourself jud. Swerte kung naay concern na friend nimo diha...what if wala? Ikaw ra jud muhatag sa imong self ana.--- Mohilum lang sila pag ing-ana (laughs). Dili man tanang tao-ing ana, pero basin naanad lang sila ana na hatagan lang... hatagan gud. Para naku better kung self-motivated ka, lalo na mag-college na baya sila next year.*
> (So in a way, I teach them self-motivation... if you really want it, there's a way, do not wait for the others. My principle also as a person is that you should be self-motivated. You don't need external factors to propel your self to ignite...because there's none. There's no one that could help you in this world but yourself only. You're lucky if you have a concerned friend... what if there's none? Only you can give that to yourself. --- They're just silent in times like that (laughs). Not all people are like that, but perhaps they're just used to being provided with everything... just given. For met it's better if you're self-motivated, specially that they'll be in college next year.) (*Interview with Teacher D, p.27)
> ***

Through the lens of the social constructivist perspective of assessment and learning, the reflective conception of PLA is closest to being socially constructivist in its view and approach compared to the structural and practical conceptions. This was shown by the teachers' awareness and acknowledgement of their role as the expert ones who could help the students maximize their learning. PLA, or assessment in general was viewed as an integral part of the teaching-learning process that was regarded as a social activity but at the same time, as individual meaning-making (Stobart, 2008) of the teachers and the students. The integration of values in teaching and assessment which was aimed at increasing student responsibility in his or her own learning (Kulieke et al, 1990) was another characteristic of a social constructivist perspective that the reflective conception of PLA showed. These indicated that the reflective conception of PLA has the highest level of sophistication of awareness among the teachers' categories of description of PLA.

Table 19 presents each of the teachers' dominant and less dominant categories of description (or conceptions) of PLA. The distinct profile characteristics of the teachers are also indicated.

Table 19 Teachers' Dominant and Less Dominant Categories of Description of PLA

Teacher	Distinct Profile Characteristics	Dominant Category of Description of PLA	Less Dominant Category of Description of PLA
Teacher A	*From a private SHS *Youngest in age *Just passed teacher's licensure exam *On his second year of teaching	Structural conception or "*law abider*"	Reflective conception or "*conscientious*"
Teacher B	*From a public SHS *Oldest in age and teaching experience *With engineering background *Handled an administrative position	Structural conception or "*law abider*"	Reflective conception or "*conscientious*"
Teacher C	*From a public SHS *With the highest educational attainment in-line with the subject being taught	Structural conception or "*law abider*"	Reflective conception or "*conscientious*"
Teacher D	*From a private SHS *Not a licensed professional teacher *With industry experience as applied physics research analyst *On his first year of teaching	Practical conception or "*scientist-at-heart*"	Reflective conception or "*conscientious*"

Table 19 shows that the most common category of desription among the four teachers was the structural conception of PLA. Both teachers from the public SHS, Teachers B and C, and one teacher from the private SHS (Teacher A) belonged to this category. This level of awareness of PLA was deemed as the farthest from being social constructivist, hence, at the lowest level. The highest category of description of PLA that was deemed as the dominant one was the practical conception. This category is at a higher level and more sophisticated in awareness than the structural conception, but lower than the reflective conception of PLA. Only Teacher D (the other one from a private SHS and the only one without a formal education training and professional license for teachers) had this as his dominant conception of PLA. No teacher emerged to have reached the highest level of conception of PLA, the reflective conception, as his dominant category of conception. The four teachers, however, were common in having the reflective conception of PLA as their less dominant category of description. This was evident in their utterances which implied the significant role of self-reflection in evaluating their teaching-learning-assessing situations and maximizing what they could do to help their students. This was one of the aspects that characterized the reflective conception of PLA.

Students' Categories of Description of PLA

In the same manner the students' conceptions of PLA discussed earlier were grouped based on their similarities and differences. A group with the same foci constituted a labeled category. Table 20 shows the students' four categories of description or conceptions of PLAand their corresponding metaphorical name and focus of conception.

Table 20 Students' Categories of Descriptions of PLA

Categories of Conception (Conception of PLA is)	Metaphorical Name	Focus of Conception	FGD Group(s) Which Belonged to the Given Category of Description of PLA
1.Grade-focused	*"Grade-Conscious"*	PLA as a means toward getting high grade in physics	Group A (From a private SHS; With the greatest number of males; all liked learning about physics; and under the youngest and least experienced physics teacher)
2.Socially-focused	*"Social"*	PLA as a social convergence that leads to better physics learning	Groups A and D (Both from a private SHS and probationary physics teachers; All expressed liking to learn about physics.)
3.Real-life-focused	*"Physical World Appreciator"*	PLA that moves the students toward understanding and appreciating the physical world around them	Groups B and C (Both from a public SHS whose physics teachers were relatively older in age and more experienced in teaching.)
4.Motivation-focused	*"Motivator"*	PLA as an engaging and motivating tool that is geared toward deeper and integrative physics learning	Groups B, C and D (All were under physics teachers who had relatively more experience.)

Similar to the teachers, analysis showed that each FGD group also had a certain dominant category of description of PLA and a less dominant one at the same time. The concept of the dominant and less dominant conceptions emerged only based on the resulting data of this study. There are also still no established mechanisms yet that quantify percentage cut-off of qualitative utterances that would be categorized into the said two types of conceptions of PLA. Having this, the researcher only based the identification of teachers' and student groups' dominant conceptions through an iterative process of determining the conception that had the most number of characterizing statements that are being expressed by a teacher or student group. The second most re-emerging conception was identified as a teacher's or student group's less dominant conception. In other words, a category of description which had aspects or characteristics that re-emerged with the most number of times within a group's utterances was interpreted as that group's dominant conception of PLA. The second most re-emerging conception of PLA was deemed as the less dominant one. Table 20 shows each group's dominant and less dominant categories of description of PLA.

Category 1 Grade-focused Conception: "*Grade-Conscious*"

The following statement mirrored the students' grade-focused conception of PLA.

1.PLA is given as a source of students' grades.

2. PLA must be given before, during and after a lesson through written tasks.

3. PLA is given to determine the effectiveness of teachers' teaching strategies.

4. PLA story is significant as it centers on the impact of experience on one's grades

This first level of the students' conception was labeled "grade-focused" and given the metaphorical name, "grade-conscious", to emphasize that scholastic achievement was the students' central view in this conception of PLA. Furthermore, the students viewed PLA as a tool to measure their level of Physics understanding and skills through formal, written and summative tests like quizzes, seatwork, problem sets and exams. FGD Group A from a private SHS and under Teacher A had this category of description as their dominant conception of PLA. This group had the most number of males (5 out of 8 or 87.5%) and all signified liking to learn about physics. Half of the group were academic awardees as they completed Junior High School.

As revealed in most of the utterances of the students in FGD Group A, the forms of PLA that were dominant in this category were limited to defined and structured problem-solving through written tasks. PLA scores were viewed as the bases of Physics grades and therefore, tasks must always be scores. The process of assessing learning was believed to be an effective way toward getting high grades in physics and was done through written tasks. These must be given by teachers before, during and after a lesson. Students who expressed this view shared that they experienced such kind of assessment process in their Junior High School and found it effective in getting good grades. Hence, if the PLA process in SHS would also focus on frequent written tasks as practice, then it may be effective in helping them get high scores in their PLAs.

With physics grades at the center of awareness in this conception, students perceived that getting a high grade or perfect score in a PLA was a direct and personal indicator that he or she gained Physics learning or understanding. Two students shared the following in support of this finding.

> Jay: *Sa ako ma'am, makabalo ko nga nakaleam n gyud ko pag taas akong grade sa physics Ma'am… and I mean sa mga.. bisag sa quizzes lang.. taas ang score. Then ano pud, kung mag- study ko kay kunyari mag-answer ko unya pagtan-aw nako sa appendix sa book kay same mi sa appendix, so didto ko makahibalo kung ano… naka-leam na jud ba ko.*
> (For me ma'am, I know that I have learned when my grade in physics is high ma'am… and I mean in the… even in the quizzes… the score is high. Then, when I study for example, when I answer and my answers are the same with those in the appendix, then that's when I know that…I have really learned.) (*FGD with Group A, p. 9)
>
> ***
>
> Trish: *Ma-feel nako ma'am na nakatuon nako pag ma… maka-perfect ko'g quiz kay dili man gud ma'am oh.. ani man gud na siya.. ang itudlo man gud ni sir kay sa panagsa layo rapud sa iyahang i-quiz. So kung masabtan jud nimu iyahang gi tudlo maski i-bali-bali pa niya iyahang i-qiuz… kung kabalo ka unsay buhaton… kung kabalo ka mo bali-bali ug formula, so murag ma-perfect nimu mga quiz… so kung*

ang gitudlo ni sir kay murag feel nako nasabtan na nako pero pag dili pud nako ma-apply sa quiz kay murag kulang pa gud ma'am... ana.
(I feel that I have learned when... when I get perfect in a quiz because it's like this ma'am... sometimes what Sir teaches is different from his quiz. So if you really have understood what he has taught, even if things' get mixed-up in the quiz, you still know what to do... when you know how to manipulate the formula, so you'd get perfect in the quiz... So if I feel that I have understood what Sir has taight but if I cannot apply it in the quiz then something is still lacking ma'am... something like that.)(*FGD with Group A, p. 14)
***

From the point of view of students another purpose of PLA was to determine the effectiveness of the teachers' teaching strategies. The focus of this awareness was the impact of instruction on student scores. Utterances of students implied that their grades were direct indicators of the effectiveness of instruction. Low scores and grades were indicative of an ineffective teaching approach and were attributed as teachers' fault. The goal of having an effective instruction was still toward getting high grades.

The shared most significant stories of PLA which focused on the impact of an experience on students' grades also implied a grade-focused conception of PLA. These stories that talked about either success or failure, fulfillment or discouragement, and happiness or sadness corresponded to their experiences of either ability or inability to answer their quizzes and exams and getting a perfect or zero score. They felt the need to do better in future PLA in order to get good grades and be successful in life. This view was deemed misleading as good grades do not necessarily result to success in life (Vatterott, 2015)

Finally, this grade-focused conception of PLA was placed at the lowest level of conceptions as it was limited only to the the understanding of PLA as a means to an end which was getting high grades. This contradicted Silcock's (2003) argument that "true education is exactly that where learners grasp what is worthwhile for its own sake rather than as means to other ends such as passing tests or hitting learning targets".

Category 2 Socially-focused: "*Social*"

The following described the students' socially-focused conception of PLA:

1. PLA must include peers for self-assessment.
2. PLA is a give-and-take relationship between teachers and students where the former gives proper lessons and test and the latter study and take the test.
3. PLA is effective when both teacher and students learn from it.
4. PLA is effective when it encourages students toward peer collaboration.
5. PLA is efficient when it provides and responds to feedback for student improvement.
6. PLA story is significant as it centers on the impact of deviating from one's usual practices on learning.

The focus of conception was on PLA as a social convergence that leads to better Physics learning. Central to this conception was the awareness that PLA was a social activity for learning Physics where the teachers, students and their peers were the major role players. These led the researcher to label this category as the "socially-focused" conception of PLA. This was further emphasized by the metaphorical name, "*social*", that was assigned to this category of description.

In this conception, teachers and students were viewed to have a give-and-take relationship. This kind of relationship was viewed to be achieved when teachers and students were faithful in living out the roles assigned to them. The teacher was viewed as the designer, facilitator and interpreter of PLA that was given to the students. Prior to the designing part, a teacher's role was believed to be giving appropriate and effective teaching instruction. The interpreter role included the giving of and responding to students' feedback, a vital component of the social constructivist's view of learning and assessment (Vygotsky, 1989). Hence, PLA effectiveness was believed to occur when both the teacher and the students learned from the meaning of the PLA results through feedback-giving and more importantly, in responding to or taking concrete actions as an output.

Central to the give-and-take social relationship among teachers, students and peers was the feedback-giving that prompted students of their learning goals. It was viewed as playing a major part by being the springboard for teacher's self-reflection. In other words, upon taking hold of the PLA results (formal and informal), self-reflection on the part of the teachers included determining the strengths and weaknessness of the students. This consequently led the teacher to also evaluate and reflect on the effectiveness of his or her instruction. This served as the prelude to the giving of feedback to the students.

Another look at the give-and -take relationship between students and teachers was given by Gipps (1999). Gipps (1999) emphasized that "there should be opportunities when criteria are discussed and negotiated with the pupil, and assessment thus becomes a more collaborative enterprise". This would allow more opportunities for establishing a teacher-pupil relationship that is based on power with the pupil as opposed to power over the pupil (Gipps, 1999).

Finally, the students' socially-focused conception of PLA believed that PLA was effective when it encouraged students toward peer collaboration. Peer collaboration was composed of informal group discussions (Akyol and Garrison, 2010) when solving problem sets. It was during this kind of social convergence where students may include their peers for determining their level of physics learning. When they were able to explain and answer their peers' questions about a certain lesson or problem and the other peer was able to understand, then the peer-teacher considered this as an indicator that he or she has learned (Crouch and

Mazur (2001). At another angle, the peer-teachers who were viewed as the smart ones in class (the ones who usually got the right solutions and answers to problems) also served as the standards of right answers. When one's answer or solution was similar to the answers of these type of peers, this was believed to indicate that they gained Physics learning.

Compared to the students' grade-focused conception of PLA, the socially-focused conception is at a higher, more sophisticated level and is closer to being social constructivist in its view and approach. This was shown by the emphasis of this conception on the social aspect of PLA where peers and teachers play a big role in the students' meaning-making of their physics learning.

Based on the analysis, no FGD Group had this category of description of PLA as its dominant conception of PLA. However, FGD Groups A and D, both from a private SHS (School Y) and under the probationary and relatively younger physics teachers, emerged to have this category of description as their less dominant conception of PLA. FGD Groups A and D expressed some of the characteristics of this category of description of PLA that were earlier discussed in details. This, however, was interpreted as their less dominant conception of PLA because they had more aspects in focal awareness that belonged to another conception of PLA. FGD Group A's dominant conception of PLA, as explicated earlier, was the grade-focused conception of PLA. Group D's dominant conception of PLA was discussed in the succeeding sub-sections.

Category 3 Real-life-focused Conception: *"Physical World Appreciator"*

The following is a recap of the students' conceptions of PLA classified as real-life-focused.

1. PLA is a self-evaluation tool used to determine one's ability to apply Physics learning in real-life.

2. PLA must emphasize the practical applications of the learned Physics concepts.

3. PLA is effective when it involves active learning.

4. PLA story is significant as it centers on the impact of practical PLA on students' learning.

The third category was labeled "real-life-focused" and the given metaphorical name, *"physical world appreciator"* to highlight the students' perception of the meaning and purpose of PLA. Students perceived PLA as a tool that would measure his or her ability to apply learned Physics concepts in real-life. In this category students believed Physics learning was achieved when one could interpret an ordinary and trivial experience from the perspective of physics concepts and principles.

With this view of Physics learning, the stress was on the inclusion of practical forms of PLA instead of the usual equation- and numerically-driven problems. Practical forms included laboratory experiments and tasks dealing with real life that required students to actively engage in meaningful learning activities and think about what they are doing (Prince, 2004). That active participation in meaningful activities promote learning was a finding of a number of Physics education researches which claimed that active Physics learning, through activity and inquiry-based approach, yielded better conceptual learning and problem-solving performances (Hake, 1998; Deslauriers et al., 2011; Scott et al., 2013; Thacker et al., 1994; and Hoellwarth et al., 2005). Slisko (2017) also showed empirical evidence of the positive impact of active physics learning on the mental, affective and creative domains of students.

Should problem-solving be included, it was stressed that such problems should reflect real-world situations. Most importantly, these problems should lead to realistic and believable answers.

FGD Group C (under Teacher C, from a public SHS, with the most number of females and all JHS awardees) was revealed as the only group having the real-life-focused conception of PLA as their dominant conception. This was evident in the students' frequent and re-emerging utterances with focal awareness on the following: (1) PLA viewed as a tool to determine their ability to apply physics in real life; (2) inclusion of practical applications of their Physics learning in PLA; (3) effective PLA as one that involved active learning through practical experiences; and (4) most significant stories shared with centrality on the impact of their practical PLA experiences on their motivation to learn. These were discussed in more details in the earlier sub-sections that focused on answering research questions 1 to 3.

The students' greater emphasis on the practical aspect of PLA over the traditional written tasks was contrary to the results on the analysis of the quarterly test and one lesson plan shared by Teacher B from School X. Although FGD Group C's physics teacher was Teacher C, the materials used by Teacher B (i.e. quarterly exams and lesson plans) were also used by their teacher since they belonged to the same public SHS, School X. The quarterly test was composed of fifty items, in multiple choice format and the lesson plan was semi-detailed. Using the levels of thinking skills of the Revised Blooms' Taxonomy it was noted that nineteen out of the fifty questions (38%) in the test were numerical problems at the level of application. This percentage was the greatest among the other levels of thinking skills like remembering, understanding and analysis. Furthermore, the lesson plan showed that for the application, evaluation and assignment parts, defined and structured word problems were given for the students to solve. These did not require practical applications of physics concepts and principles hence, did not respond to what the students preferred for in this conception of PLA.

While FGD Group C had this category as its dominant conception of PLA, FGD Group B (under Teacher B and also from the public SHS, School X) was revealed by the analysis as having real-life-focused conception of PLA as their less dominant conception. FGD Group B expressed that the meaning of PLA was an evaluation tool that determined the students' ability to apply physics in real life. Consequently, the group perceived that the process of PLA must be one that emphasized practical applications. As discussed earlier in this chapter, this group was also the one which called for problem sets that yield realistic, believable and sensible values or answers.

The "physical world appreciator" conception of PLA emerged both as the dominant and less dominant conceptions of the two groups, FGD Groups C and B, respectively. These groups both belonged to the public SHS (School Y). In contrast to School Y (private SHS in this study), School X had no physics laboratory facility yet during the conduct of this study. Teacher B of FGD Group B shared that in times when their class had a practical PLA like a laboratory activity, they would have to use their Junior High School science laboratory. Teacher B shared that the said facility, however, was still relatively underequipped compared to the private schools such as School Y. With this situation, Teacher B reiterated that he tended to give lectures and problem sets instead. On the positive note, as discussed in the earlier part of this chapter, Teacher B found this approach effective and efficient in covering as much lessons within the semester.

Finally, the real-life-focused category of description was considered to be at a higher level than the grade-focused and socially-focused conceptions because it viewed PLA scores as partial measures of students' level of understanding Physics. It was the students' ability to see Physics in action within their practical experiences of the physical world that was a higher and more complete measure of one's Physics learning.

Category 4 Motivation-focused: "*Motivator*"

The following is a recap of the students' ways of understanding and beliefs of PLA categorized under motivation-focused conception of PLA:

1. PLA must be engaging.
2. PLA is effective when it is motivating.
3. PLA is efficient when it provides enough time for the students.
4. PLA is efficient when it encourages long-term retention of learned concepts.
5. PLA is efficient when it is appropriate to the students' learning capabilities.

The descriptive label, "motivation-focused" conception was assigned by the researcher to the students' fourth category of description of PLA to highlight the view that PLA is an engaging and motivating tool that promotes integrative learning, deep understanding and long-term retention of acquired Physics knowledge and skills. The metaphorical name, "*motivator*", was then given to emphasize the perceived role of PLA in getting students motivated to engage in learning Physics. In this conception, students described PLA as engaging and motivating when the emphasis is on the practical and real-life applications of Physics and done even without any corresponding grades. Variety in PLA forms which addressed their different learning styles was another motivating factor.

PLA activities that required students to link, connect and integrate their past Physics learning with the new ones were also viewed as engaging and motivating. This feature of PLA activities promote what is referred to in this study as integrative Physics learning. In the context of this study, integrative Physics learning primarily involved connecting the past knowledge with the present concepts and understanding. This characteristic of integrative learning was borrowed from one of Dumford et al's (2015) description of deep learning approach which teaches students to "connect ideas from a course to his or her prior experiences and knowledge. Harlen (2006) referred to these as "metacognitive experiences" or a "stream of consciousness" wherein "the learner recalled and integrated his information, memories, or earlier experiences in the process of solving a current-moment cognitive problem".

Longer time for instruction and PLA was also believed to result to deeper Physics learning, hence, indicative of an efficient and motivating PLA. Students' speed in solving word problems, as what their usual PLA experiences showed, were viewed as superficial level of Physics learning by the students in this conception. This was stressed as less efficient and non-motivating PLAs. This was believed to be a waste of teacher's and students' effort and time, therefore, viewed as indicative of an inefficient PLA.

Indeed, this conception viewed PLA as more than a source of students' grades; a social activity; and a lens to better see, understand and appreciate the physical word. Instead, this conception considered PLA as a way towards the attainment of a deeper and long-lasting integrative Physics learning. This overarched the first three categories of dsecription, hence, putting this conception at the highest level among thestudents' conceptions of PLA. This conception emerged as the most sophisticated among the other three students' conceptions of PLA because it was deemed as closest to being social constructivist in its perspective. As students find PLA motivating to learn more about physics, they voluntarily take charge of their own learning as evidenced by their active participation in the learning and assessment process (Glasersfeld, 1989).

Taras (2001) also had the same view with Glasersfeld (1989) by emphasizing that when students were able to think metacognitively, reflected on their own learning and could evaluate the quality of their own performance, that was when they were able to take ownership of their own learning. Adams (2006) resonated with these two studies by emphasizing that in a social constructivist classroom, "design of learning opportunities and methods for demonstrating and mediating knowledge into the socio-cultural space should rest at least partly with pupils". When students are given the opportunity to navigate on their own their search for and presentation of answer, "feelings of importance and worthiness" are nurtured (Adams, 2006).

The characterisitics of the students' motivation-focused category of description of PLA in this study resonated with the students' views in the study of Sambel, et al (1997) which revealed that students viewed assessment as being fair and having a positive impact on their learning when it had the following characteristics: "relates to authentic tasks; represents reasonable demands; encourages students to apply knowledge to realistic contexts; emphasizes the need to develop a range of skills; and is perceived to have long-term benefits" (Sambell et al (1997).

Analysis showed that FGD Groups B and D, from a public and private SHS, respectively, had the motivation-focused category of description as their dominant conception of PLA. This implied that most of the utterances of these two groups had aspects of focal awareness that characterized the motivation-focused conception. Students in Group B repeatedly emphasized that for PLA to be effective and efficient, it had to be motivating. A motivating PLA was described as follows: (1) in variety; (2) appropriate to students' capabilities; (3) with feedback mechanism that is non-discriminating; (4) engages students to learn not for any corresponding grades; and (5) gives enough time to students.

Students in Group D described their conceptions that implied as motivation-focused. These are summarized as follows: (1) PLA must be engaging; (2) more formative PLAs that develop deep learning must be given; (3) a motivating PLA is one that makes students curious instead of just getting high grades; (4) an efficient PLA is one that is integrative which allows students to link past and present learning; and (5) the impact of a motivating and engaging PLA to students' drive to achieve long-lasting, deep and meaningful physics learning.

Although the two groups were the same in their dominant conception of PLA, they differed, however, in their less dominant conception of PLA. As discussed earlier, Group B's less dominant conception was the real-life-focused while Group D's was the socially-focused. Group B's teacher (Teacher B) was more senior in age and teaching experience than Group D's teacher (Teacher D).

To summarize the answers to research question number 4 on the students' part, Table 21 presents the student FGD Groups' dominant and less dominant categories of description of PLA. Profile characteristics that were distinct to each FGD Group were also highlighted in Table 21 to re-emphasize the context of the presented results and analysis.

Table 21 Students FGD Groups' Dominant and Less Dominant Categories of Description of PLA

FGD Group	Distinct Profile Characteristics	Dominant Category of Description of PLA	Less Dominant Category of Description of PLA
Group A	*Private SHS *With the greatest number of males (5 out of 8) *All liked learning about physics.	Grade-focused conception or "*grade-conscious*"	Socially-focused conception or "*social*"
Group B	*Public SHS *Equal number of males and females *More than half disliked learning physics (5 out of 8)	Motivation-focused conception or "*motivator*"	Real-life-focused conception or "*physical world appreciator*"
Group C	*Public SHS *With the greatest number of females (6 out of 8) *All were JHS awardees *More than half disliked learning physics (5 out of 8)	Real-life-focused conception or "*physical world appreciator*"	Motivation-focused conception or "*motivator*"
Group D	*Private SHS *Had the youngest (15-16 y.o) and oldest (19-20 y.o.) students among the 4 groups *With the second greatest number of females (5 out of 8) *All liked learning about physics.	Motivation-focused conception or "*motivator*"	Socially-focused conception or "*social*"

As shown in Table 21, the two FGD groups, A and D, from the private SHS, School Y, differed in their dominant conception of PLA. Group A had the least level of awareness of PLA which was the grade-focused conception while Group D reached the highest level, the motivation-focused conception of PLA. They both, nonetheless, had the socially-focused conception of PLA as their less dominant conception.

The two FGD groups, B and C, from the public SHS, School X, also differed in their dominant conceptions of PLA. Group B's dominant conception was the highest category, the motivation-focused, while this was Group C's less dominant conception. Group C's dominant one was the real-life focused while this was Group B's less dominant conception of PLA. The dominant conceptions of the two groups from the public SHS preferred practical forms of PLA and PLA that engage students toward integrative and deep learning in Physics.

The teachers' and students' categories of description of PLA form the "referential aspect" of this phenomenographic study. This aspect described "what is being experienced" (Webber and Johnston, 2015). The next sub-section presented the "structural aspect" of the analysis which visually showed how the teachers' and students' categories of description of PLA related with one another. The description of the relationship was focused on their position in the hierarchy of completeness of awareness of PLA; how they agreed (similarities); and varied (differences) with one another (Márton and Booth, 1997). These were captured through a visual presentation or map that is called the 'outcome space (Marton and Booth, 1997).

Relationships Between Teachers' and Students' Conceptions of PLA

The fifth and final research question of this study asked about the relationships between the teachers' and students' categories of description of PLA. The modified phenomenographic analysis adopted in this study enabled the researcher to articulate her novel categories of description. The relationships (i.e similarities, differences and hierarchy) between the categories were also structured by the researcher. The articulated features of the relationships between the categories were the researcher's interpretation of the data through the lens of the structure of awareness analytical framework of phenomenography (Cope, 2004). These results may be unique to the sample in this study (with their profile characeristics), hence, the designed categories of description and outcome spaces collectively was a novel contribution of this study to the body of knowledge.

The outcome spaces that emerged from this study showed the hierarchy, variations, and similarities of the PLA conceptions in the context of the involved teachers and students. According to Larsson and Holmstrom (2007) "the hierarchical structure of the outcome space can be inferred from the data or it can be a result of a theoretical analysis of the categories". As mentioned in the early part of this chapter, the "hierarchy does not necessarily represent a transition from a worse state to a better state, but instead a transition from a less complete understanding to a more complete understanding" (Bucks and Oakes, 2011) and of an expanding awareness (Irving and Sayre, 2013).

For clarity and simplicity of the presentation, the researcher constructed two types of outcome spaces, each highlighted a particular relationship. The first type of outcome space (Figures 3 and 4) highlighted the hierarchical architecture of the teachers' and students' categories of description, respectively. The second type of outcome space (Figure 5) focused on the similarities and differences between the teachers' and students' categories of description of PLA.

For the first type of outcome space (Figures 3 and 4), the emerging categories of description of PLA were hierarchically arranged as represented by the expanding areas of the ellipses that represent the categories. Each vertical ellipse stands for a theme of conception of PLA. The category with the least level of awareness was placed at the most bottom part and represented by the smallest ellipse. The more sophisticated ones reached higher levels in the figure and were larger in areas. The ellipse which subsumed the rest of the other smaller ellipses represented the category of conception that is at the highest level of PLA awareness.

The vertical axis of the outcome space was also labeled as "themes of expanding awareness" which was borrowed from Irving and Sayre (2013). The "themes of expanding awareness" showed the different levels in which the teachers and students described and experienced PLA (Irving and Sayre, 2013). The categories of description were "distinguishable via the variation within the themes of expanding awareness" (Irving and Sayre, 2013). In this study, the themes of expanding awareness were captured by the three categories of description of PLA by the teachers (*structural, practical* and *reflective* conceptions) and the four categories of description by the students (*grades-focused, socially-focused, real-life-focused* and *motivation-focused conceptions*).

Figure 3 shows the teachers' outcome space of the hierarchy of the categories of description of PLA.

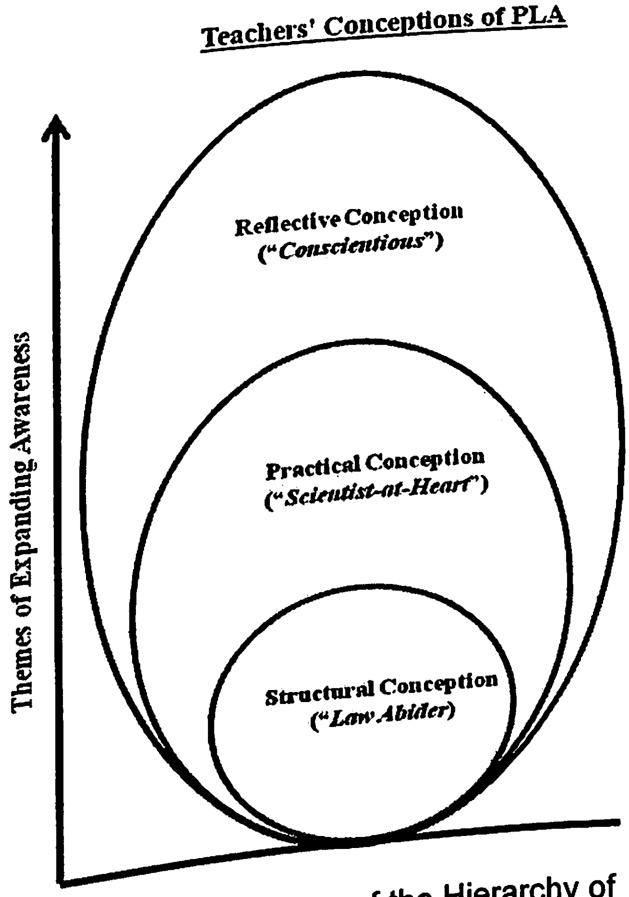

Figure 3 Outcome Space of the Hierarchy of Teachers' Categories of Description of PLA

Figure 3 shows the teachers' reflective conception as the highest level and the most sophisticated awareness of PLA with respect to the social constructivist perspective of assessment. This level superseded the other two, the practical and structural conceptions, with the latter as the lowest and most simplistic conception of PLA. The framework of this heirarchical arrangement of teachers' conceptions of PLA is discussed as follows.

The dimension of variation among the teachers' conceptions was found to be the complexity of the thinking skills that came with the teachers' view of the meaning, purpose and process of PLA. In the structuring of the outcome space for the teachers' conceptions, the principles of the levels of thinking skills under the Revised Bloom's Taxonomy (Anderson and Krathwohl, 2001) were anchored on. The two lowest levels of thinking skill in the Revised Bloom's Taxonomy are remembering and understanding. The levels of complexity involved in recalling data, facts, or information and explaining ideas, statements or principles are relatively simpler than those at the higher level of the hierarchy (Anderson and Krathwohl, 2001). These two levels of thinking skills are parallel to the level of thinking skills that characterize a simple and structural view of PLA.

The applying and analyzing levels, on the other hand, require a more complex mental requirement as a person applies his or her understanding in another context and break down big ideas to establish relationships (Anderson and Krathwohl, 2001). The complexity of these mental skills corresponded to the teachers' practical conception of PLA. This was evident in the teachers' view of an effective and efficient PLA as one that helps students understand and appreciate the physical world through their physics learning.

The evaluating skill, though not at the highest level in the Revised Bloom's Taxonomy, corresponded to the highest level of teachers' conception of PLA which is the reflective conception. In the level of evaluating, the ability to reflect and arrive at a judgement or decision is more complex than the earlier levels of thinking skills discussed (Anderson and Krathwohl, 2001). This ability corresponded to the characteristics of the teachers' reflective conception of PLA where reflection is central to the teachers' PLA views, beliefs and experiences. Hence, teachers' reflective conception of PLA is the closest to being social constructivist in its perspective of the teaching-learning process.

Figure 4 shows the students' outcome space of the hierarchy of the categories of description of PLA.

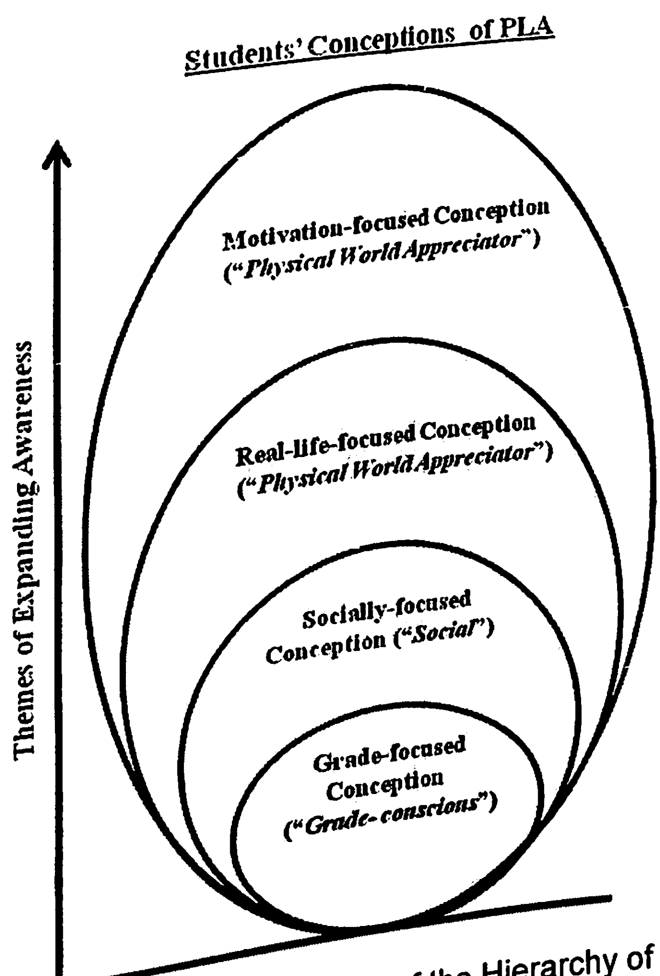

Figure 4 Outcome Space of the Hierarchy of Students' Categories of Description of PLA

Unlike the teachers who expressed three levels of categories of description of PLA, four levels of PLA conceptions were saturated through the phenomenographic analysis of the four student FGD groups' utterances. As shown in the outcome space in Figure 4, at the bottom of the hierarchy and with symbolized by the smallest ellipseis the grade-focused conception. Higher than this is the socially-focused conception which is represented by the second smallest ellipse. The second highest level of category is the real-life-focused which is represented by the second highest and largest ellipse. These three levels of conceptions are all superseded by the motivation-focused conception of PLA which is symbolized by the most expanded and highest ellipse in the outcome space shown in Figure 4. The basis of this hierarchical architecture is discussed in the succeeding paragraphs.

The students' level of self-awareness in the context of how they viewed the meaning, purpose and process of PLA and their goal of attaining Physics learning were the dimensions of variation among the students' conceptions. These comprised what Case and Gunstone (2002) referred to as metacognitive development which shows a student's progress or shift in his or her approach to learning. Case and Gunstone (2002) further described metacognitive development as developments in how students view and organize their learning, their progress "toward self-assessment and personal development with regard to views on the purpose of learning and long-term career goals" (Case et al., 2001).

Irving and Sayre (2013) developed three stages of physics identity development where levels of metacognitive sophistication or self-awareness development of students vary in three stages, from being at a level of a student, to an aspiring physicist and a physicist. These stages guided this study in determining the hierarchy of the students' conceptions of PLA by analyzing the degree of sophistication of students' self-awareness or metacognition in the context of how they viewed the meaning, purpose and process of PLA and the factors that drove their motivation to achieve physics learning.

Irving and Sayre (2013) described physics identity of a student as his or her personal "understanding about and actual ways in which one is positioned within the social world of physicists". In Irving and Sayre's (2013) stages of physics identity development, the lowest stage was the student level which was characterized by a lack of self-awareness or low metacognition level and a naive view of a physicist as someone who obtains an amount of knowledge. In this study, students' grade-focused conception of PLA corresponded to Irving and Sayre's (2013) student level of awareness as students' viewed PLA simply as a source of grades which then led to superficial learning. This was represented by the smallest and lowermost ellipse in Figure 4.

The second and higher stage of Irving and Sayre's (2013) physics identity development was the aspiring physicist level. In this level, a student has an "evolved sense of awareness" and views a physicist as someone who contributes to the enrichment of the body of knowledge in physics or a practising physicist. The students' socially-focused and real-life-focused conceptions of PLA corresponded to this stage, with the former at the lower level than the latter. These two conceptions of PLA were deemed to be parallel with Irving and Sayre's (2013) aspiring physicist stage as they both focused on perceiving PLA as a social convergence toward better physics learning, but the real-life-focused conception included the goal of a better understanding and appreciation of the physical world through PLA.

Finally, Irving and Sayre's (2013) highest level of physics identity was the physicist level. Students who reached this stage were those with complete self-awareness and viewed oneself as already being an actual physicist (Irving and Sayre, 2013). The students' motivation-focused conception of PLA as the highest level of students' conception in this sudy, corresponded to Irving and Sayre's (2013) physicist level. This was because motivation-focused conception was characterized by an understanding of PLA that overarched all the other conceptions. It was also focused on PLA as one which must be motivating and engaging the students to gain deeper, life-long and integrative physics learning. Students' responsibility of his or her own learning, together with a deep sense of self-assessment and reflection, also marked the motivation-focused conception of PLA. These characteristics qualified this students' conception of PLA as the one closest to being social constructivist in its perspective. Consequently, this conception is represented by the highest and most expanded ellipse in Figure 4.

Table 22 shows each teacher's and his corresponding group of students' dominant categories of description of PLA.

Table 22 Teachers' and Students' Dominant Categories of Description of PLA

Teacher	Teachers' Dominant Category of Description of PLA	FGD Group	Student Group's Dominant Category of Description of PLA
Teacher A (From a private SHS; the youngest and least experienced)	Structural or "law-abider"	Group A (With the most number of males; half of the group were JHS awardees)	Grade-focused or "grade-conscious"
Teacher B (From a public SHS; the oldest and longest teaching experience; with engineering background and administrativee position)	Structural or "law-abider"	Group B (With equal number of males and females and least number of JHS awardees)	Motivation-focused or "motivator"
Teacher C (From a public SHS; with a post-graduate level in physics education)	Structural or "law-abider"	Group C (With the most number of females and JHS awardees)	Real-life-focused or "physical world appreciator"
Teacher D (From a private SHS; with Applied Physics degree and industry research experience; without a professional teacher's license)	Practical or "scientist-at-heart"	Group D (Had more females than males; had the youngest and oldest students; and only one was not a JHS awardee)	Motivation-focused or "motivator"

As shown in Table 22, the teachers did not necessarily have the same levels of PLA awareness sophistication with their students as only Teacher A and his students, Group A, was the only teacher-students pair that both had the lowest level of PLA conceptions, structural and grade-focused for Teacher A and his students, respectively. Teacher B (the oldest and most senior in teaching) had the lowest conception (structural) as his dominant category of description of PLA, while his students' (Group B) dominant conception was of the highest level among students' conception (motivation-focused). Teacher C (the only one with the highest educational level in physics education among the four teachers) also had the lowest dominant conception of PLA similar to Teachers A and B, but his class (Group C) expressed PLA conception that was the second highest level among the student groups which was the real-life-focused conception. Finally, student FGD Group D's dominant conception was the highest one (motivation-focused) while their teacher (Teacher B) had his dominant conception that was just at the second level of sophistication among the teachers (practical).

Combining Figures 3 and 4 into a single visual map (outcome space) and placing the different levels of teachers' categories of description of PLA vis-a-vis those of the students', Figure 5 is consequently able to show a model of the relationships of the teachers' and students' conceptions of PLA.

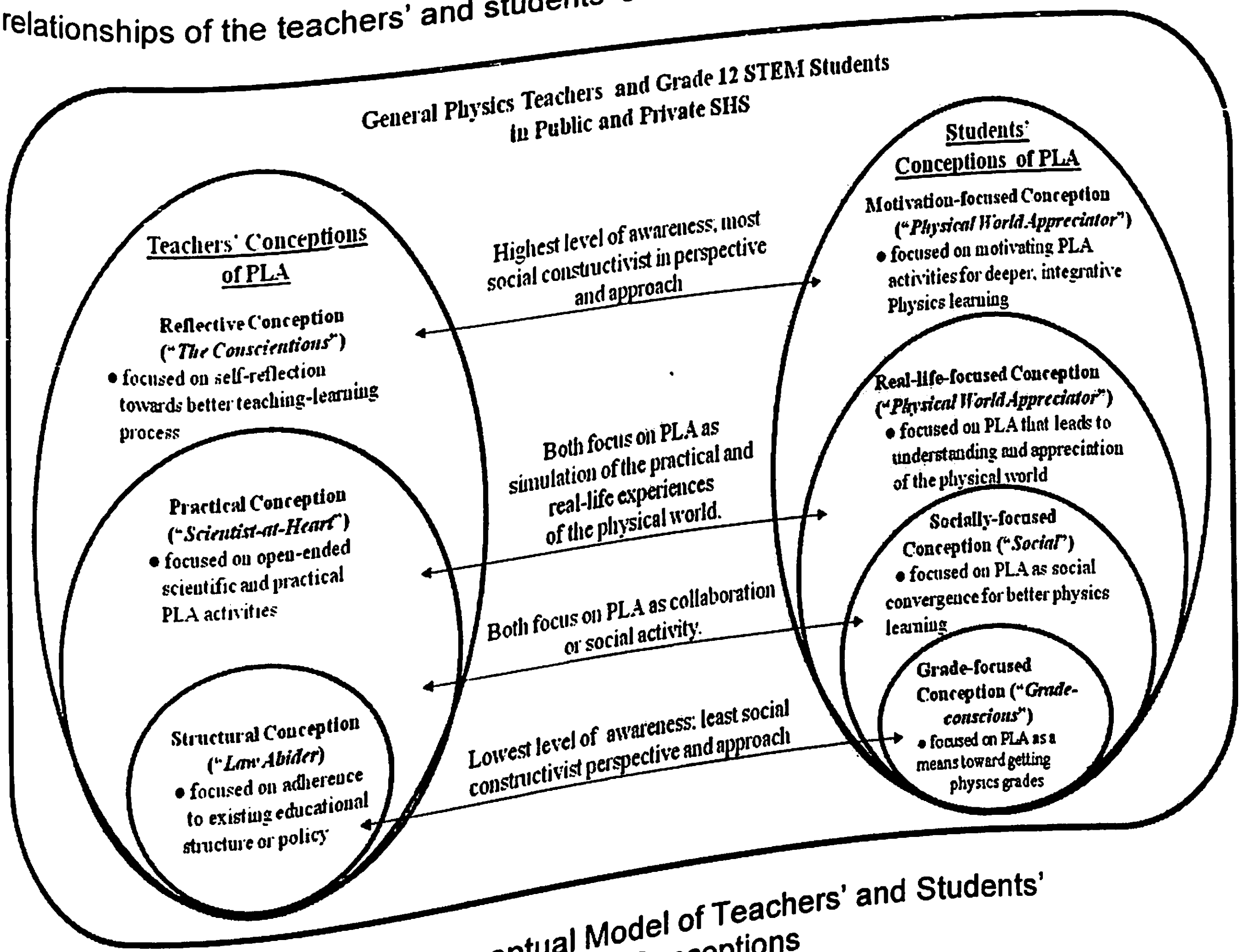

Figure 5 A Conceptual Model of Teachers' and Students' Levels of PLA Conceptions

The teachers' reflective conception is at the highest level in the hierarchy as it is closest to being social constructivist in its perspective and approach. The teachers' reflective conception subsumes the two less complete conceptions of PLA, the practical and structural conceptions. For the students' conceptions of PLA, the motivation-focused is at the highest level of PLA awareness and the most social constructivist, thereby subsumes the other three students' conceptions. Teacher's structural conception is similar to students' grade-focused conception as both are farthest from being social constructivist. Both are at the lowest level of awareness of PLA. Teachers' practical conception is at the middle of the structural and reflective conceptions. This is parallel to the students' socially-focused and real-life-focused conceptions, with the latter at a higher position in the students' hierarchy of conceptions. These three conceptions are similar Teachers' practical and students' socially-focused conceptions of PLA are similar as both centers on PLA as collaboration of social activity. This teachers' conception and students' real-life-focused conception resonate with each other as both focus on PLA as a simulation of the practical and real-life experiences of the physical world.

The conceptual model of relationships of teachers' and students' conceptions of PLA (Figure 5) further shows the ellipses to be within the bounds of the large rectangular geometric figure. This shows that the various conceptions of PLA are within the profile context of the General Physics teachers and Grade 12 STEM students from public and private SHS.

Finally, based on the process and results of this study, a conceptual framework in determining the levels of teachers' and students' conceptions of PLA was designed. This is one of the primary theoretical contributions of this study. Figure 6 shows the conceptual framework.

Conceptual Framework of Study

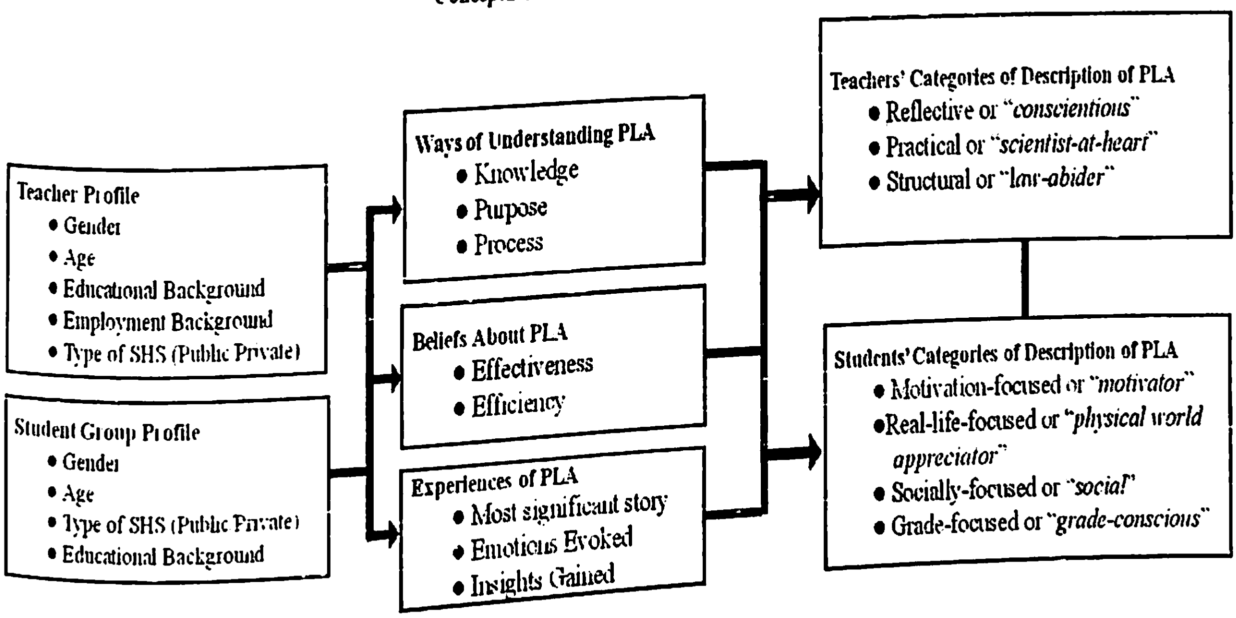

Figure 6 Conceptual Framework of Study

As shown in the conceptual framework in Figure 6, teachers' and student groups' profiles (first two boxes at the left side, respectively) provide context to the resulting categories of description of PLA. The essential profile characteristics that are common to both participating groups are their gender, age, educational background and type of SHS that they belong to (public or private). Teachers' employment background are included for this group, particularly their length of teaching experience.

The three boxes next to the teachers' and student groups' profile boxes represent the following: teachers' and students' ways of understanding PLA in the three dimensions (knowledge, purpose and process) for the first center box; beliefs about PLA effectiveness and efficiency for the second center box; and experiences of PLA in the three dimensions (most significant story, emotions evoked during and insights gained after their PLA experiences) for the third center box. Each of these variables and their corresponding sub-variables are explored and described through the structure of awareness analytical framework of phenomenography. These three (understanding, beliefs and experiences) collectively compose the conceptions of PLA.

Through the iterative and interpretive process of the phenomenographic paradigm, three teachers' categories of description of PLA (structural, practical and reflective, in ascending levels of awareness from bottom to top as shown in the top box at the right side of the framework) , and four students' conceptions of PLA (grade-focused, socially-focused, real-life-focused, and motivation-focused, also in increasing levels of awareness) are described. These resulting categories of description are within the profile context of the teachers and students both from the public and private SHS.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study explored and described the SHS teachers' and students' ways of understanding, beliefs about and experiences of PLA. Phenomenographic research paradigm and exploratory-descriptive research design were employed to achieve the said purpose. The sample included purposively selected teachers and students in general physics 1 from two purposively selected SHS in Davao City, Philippines, during the first semester of school year 2017-2018. Qualitative data were collected through semi-structured interviews for teachers, FGD sessions for students, classroom observation and analysis of PLA tools. A modified phenomenographical analysis (Marton and Booth, 1997), through the structure of awareness analytical framework (Cope, 2004) was used in developing the teachers' and students' conceptions of PLA.

This chapter has three parts: summary of findings, conclusions and recommendations.

Summary of Findings

The final outputs of the phenomenographical analysis in this study were the referential and structural aspects of PLA. The referential aspect was composed of the teachers' and students' categories of description, or conceptions of PLA, while the structural aspect consisted of the outcome spaces, diagrams that presented the hierarchy, similarities and differences among the teachers' and students' categories of description of PLA. The teachers' and student' understandings, beliefs about, experiences and categories of description of PLA provided answers to research questions one to four. The outcomes spaces provided the answer to research question number five on the relationships between the teachers' and students' categories of description of PLA.

Each teacher and student FGD group expressed one dominant conception of PLA and another as the less dominant one at the same time. The following paragraphs discuss each of the teachers' and students FGD groups' conceptions of PLA and their positions in the structure of interrelationships in the outcome spaces.

Three teachers' categories of description of PLA were revealed in the analysis, namely: the structural or "law-abider"; practical or "scientist-at-heart"; and reflective or "the conscientious". The structural conception centers on the understanding that the meaning, purpose and process of PLA are determined by an existing educational structure or policy, particularly a curriculum guide from government. Both teachers from the public SHS (Teachers B and C) and Teacher A from the private SHS were revealed to have this kind of category of description of PLA as their dominant conception. They generally expressed understanding and beliefs that students' scores and grades in physics are direct indicators of the students' level of physics learning vis-a-vis the learning standards in the curriculum guide.

These teachers also believed that students' PLA scores indicate the extent of PLA effectiveness and efficiency, where high scores are equated to effective and efficient PLA. PLA efficiency was also believed to be determined by the teachers' rate of teaching the required learning competencies. This teachers' conception of PLA describes a simplistic view of PLA where adherence to an externally imposed structure of proceeding is central to the teachers' focal awareness. In the course of ensuring that the structure is followed, teachers tended to resort to traditional approach in their instruction and giving of PLA which then resulted to surface-level physics learning among the students. With respect to the social constructivist perspective, the teachers' structural conception of PLA is relatively far from being social constructivist in its approach, hence, this conception is deemed as the least complete in its level of awareness and is placed at the bottom in the hierarchy shown in the outcome space.

The practical or "scientist-at-heart" conception of PLA by teachers, on the other hand, was centered on optimizing the practical aspect of PLA through open-ended experiments and experiential approach in teaching physics. Included in this conception of PLA was the belief that the essence of giving PLA to students is not just to determine the students' level of physics understanding, but also their scientific process skills in investigating or searching for answers to problems. Laboratory activities are the preferred type of PLA as they simulate normal science or how real-life scientists work. Moreover, students' actual experiences and narratives of their encounter with the physical world were used as springboard in learning a physics concept or principle or in word problems for application. This practice is believed to be helpful to the students in linking the physics learning from the classroom to appreciating its practical applications in real life. Since this conception goes beyond viewing PLA as mere fulfillment of a mandated process, the teachers' practical conception of PLA is a relatively more complete awareness and closer to being social constructivist in its approach to PLA than that of the structural conception of PLA. Hence, its place in the outcome space is above the level of the structural conception of PLA.

Only Teacher D had the practical category of description of PLA as his dominant conception. He was the only teacher in the study who had no formal education training nor a license for professional teachers. He, however, was the ony one who had an industry experience as applied physics research analyst prior to his teaching in the SHS.

At the highest level in the hierarchy of teachers' conceptions of PLA is the reflective or "the conscientious" conception. Central to this conception is the reflective aspect of PLA which is believed to provide teachers opportunity for introspection or self-assessment on the level of their physics teaching. It is believed in this conception that students' performance in PLA may be a point of reflection on whether or not one's teaching approach was helpful in developing deep physics learning among students. The goal of self-assessment, therefore, is to ponder on ways of improving one's instruction, the whole system of doing PLA and the physics curriculum. Feedback-giving to students, as a result of reflection, is another focal point of the teachers' reflective conception.

Furthermore, values-integration in physics teaching and PLA was an insight in the reflective conception of PLA which was believed to be important for the students to succeed in life even after SHS. These characteristics of the reflective conception implicitly encourage students to take responsibility of their learning and PLA performance. Hence, the teachers' reflective conception of PLA is closest to being social constructivist in its approach to PLA. This makes it the most complete in awareness among the teachers' conceptions of PLA, thus, putting it at the highest level in the hierarchy shown in the outcome space.

The four teachers in this study all exhibited the reflective category of description of PLA as their less dominant conception. This was evident in their inclusion of self-reflection in PLA and the whole teaching-learning process. This was believed to be helpful to them in maximizing whatever they have in their situation to better help their students. No single teacher in this study, however, showed this highest level of PLA conception as his dominant category of description of PLA.

The phenomenographic analysis revealed, four levels of students' conceptions of PLA, namely: the grade-focused or "the grade-conscious"; socially-focused or "the social"; real-life-focused or "physical world appreciator"; and motivation-focused or "the motivator". At the lowest level of completeness of awareness is the grade-focused conception of PLA where the essence of PLA is viewed merely as a fundamental source of grades in physics. High scores or grades in PLAs are believed to be a direct collective indicator of an effective and efficient teaching instruction and PLA system.

The grade-focused conception of PLA also centers on students' primary goal of getting high grades in physics as the driving force of physics learning. Achieving high marks in their PLAs and assessment in general, are believed to be a ticket to a good life in the future. The simplistic view of PLA in the grade-focused conception often leads students to surface-learning approaches in learning physics. This implies that this conception of PLA is at the lowest level of completeness in awareness compared to the other students' conceptions of PLA, hence, putting it at the bottom part of the outcome space of hierarchy (Figure 4). FGD Group A, under Teacher A of the private SHS, was the only group which emerged as having this category of description of PLA as its dominant conception. This group was distinct as having the most number of males (5 out of 8) and similar to the other group of the same school (Group D), all of the students signified liking to learn about Physics.

The students' socially-focused conception or "the social" is deemed to represent a more complete level of awareness of PLA than the grade-focused conception. Students in this conception of PLA expressed an understanding that transcended the sole view of PLA as a means to getting physics grades. Instead, PLA is understood to be a social activity where one interacts with teachers and peers to achieve a better physics learning. PLA that encourages peer collaboration and promotes give-and-take relationship between students and teachers is believed to indicate effectivity.

In the socially-focused conception, an efficient PLA is believed to be one that provides and responds to feedback for the improvement of students' PLA performance. Peer collaboration, however, was centered only on written tasks such as problem sets and seatwork. The students' socially-focused conception, therefore, is more social constructivist in its views of PLA and physics learning than the grade-focused conception. This secures a higher place in the outcome space for the socially-focused conception than the grade-focused conception.

Both groups (A and D) from the private SHS (School Y) in this study emerged as having the socially-focused conceptionof PLA as their less dominant conception. Both groups were also under the novice-level teachers (Teachers A and D) in terms of the years of teaching experience of less than five years. On the other hand, neither of the groups from the public SHS (groups B and C) were revealed as having this category of description as their dominant nor less dominant conception of PLA.

The real-life-focused conception or "physical world appreciator" is centered on the understanding that PLA and physics teaching must be directed toward developing the ability of students to understand and appreciate the physical world around them. Students who expressed this kind of PLA conception believed that an effective PLA is one which provides them opportunities to experience, manipulate and appreciate physics principles in action in their daily lives. More than just getting high grades in physics and collaborating with teachers and peers, the real-life-focused conception is centered on gaining physics understanding for real-life and practical applications. Hence, this students' conception is more complete in its level of awareness and has a more social constructivist perspective of PLA than the grade-focused and socially-focused conceptions of PLA. In the outcome space, therefore, the real-life-focused conception is placed at the top of the levels of the other two students' conceptions.

FGD Group C (from the public SHS, under Teacher C) had the real-life-focused conception as its dominant conception of PLA. This group was the one with the most number of females (6 out of 8) and all were JHS awardees. More than half of the group, however, disliked learning Physics. The other group from the public SHS (FGD Group B) also had this category of description but as its less dominant conception of PLA. Like Group C, more than half of the students also expressed disliking to learn about Physics. Both groups from the public SHS repeatedly clamoured for more practical forms and types of PLA.

Finally, the students' motivation-focused conception or "the motivator" views that the meaning, purpose and process of PLA must be directed toward promoting deeper, life-long and integrative physics learning over the superficial and temporal one. This can be achieved through PLA activities that emphasize the applications of physics learning in real-life situations. Unlike the real-life-focused conception that focuses on laboratory activities and real-life-based problem applications, the motivation-focused conception is more open-ended in its view of employing varied forms and types of PLA. Through variety, it is believed that the different learning styles of students are responded to, hence, is believed to be engaging and effective.

Increasing the time allotted for PLA and physics teaching in general, is also believed to be contributing to the efficiency of PLA as this is believed to foster deeper and integrative physics learning. Furthermore, peer collaboration and active learning are also implied to be a part of a richly-varied kind of PLA system. On top of these is the belief that students have the responsibility of their own learning, hence, they are to take active participation in the construction of their own understanding. These characteristics that describe the motivation-focused conception of PLA show that it has the highest level of completeness in awareness than the other three students' conceptions of PLA. This is also the one that is most social constructivist in its PLA perspective. Hence, the students' motivation-focused conception of PLA subsumes the grade-focused, socially-focused and real-life-focused conceptions of PLA and is positioned at the topmost level of the hierarchy of expanding awareness in the outcome space.

FGD Groups B from the public SHS (School X) and D from the private SHS (School Y) both emerged to have this catergory of description as their dominant conception of PLA. These groups generally reiterated an understanding, sets of beliefs and experiences of PLA that are leaned towards PLA for an integrative, meaningful and deep Physics learning. The former was under the Physics class of a relatively more senior teacher (Teacher B who also had an eningeering degree) while the latter was under a novice one (Teacher D who also had an applied physics industry background).

Conclusions

The conclusions drawn from the findings of the study are:

1. Majority of the teachers express a simple and naive way of understanding the meaning, purpose and process of PLA. PLA is understood as a tool that must be outlined from a given curriculum guide and is used to determine students' level of physics learning. PLA is viewed as a means

to determine students' grades and must be given for the teachers to fulfil their fundamental responsibility of giving grades. PLA scores and physics grades are understood to be direct indicators of students' level of physics learning and effectiveness of teachers' instruction. This simplistic view shows that an external educational policy is at the center of their awareness of meaning, purpose and process of PLA. This simplistic understanding of PLA is the most common way of understanding in the public and private SHS physics teachers in this study.

2. A way of understanding the meaning of PLA that is common among the student groups is that PLA is a tool that measures students' knowledge and understanding of physics. The groups, however, differ on their foci. A group from the private SHS generally understands PLA as the main source of their physics grades, hence, must be given to them. They are also focused on the summative or graded dimension of PLA such as written quizzes, problem sets and exams. Physics learning is generally aimed at getting high PLA scores. A group from the public SHS is more focused on PLA forms and methods that have real-life context and practical applications. And two groups both from a public and private SHS are more centered on the meaning, purpose and process of PLA that motivate them to learn physics beyond grades and appreciation of the physical world. They generally understand and hope for PLA as a tool toward a deeper and more meaningful physics learning.
3. On teachers' beliefs about PLA effectiveness, simple and naive teachers' views are expressing that PLA is effective when it results in high PLA scores of students and aligned with the curriculum guide. Implying a more

complete awareness of PLA is the belief that students' PLA scores are only deemed valid when the items are clear to the students and assess only what have been taught. Valid PLA is believed to be equivalent to an effective PLA. This belief centers on the provision of continuous feedback to students about their PLA performance. Self-reflection on the part of the teacher, in the context of evaluating and interpreting students' PLA results, is central to this belief of PLA effectiveness. All of the teachers expressed utterances that are both of simple and sophisticated levels of understanding PLA. These show that teachers indeed, have overlapping ways of understanding that may be of low and high levels of completeness all at the same time.

4. On teachers' beliefs about PLA efficiency, most of the teachers express naive and low level of awareness of PLA. These teachers believe that high PLA scores directly indicate efficient PLA as this enables them to quickly cover several topics by not re-teaching.
5. On students' beliefs about PLA effectiveness, common to one public and private SHS student groups FGD is the belief that an effective PLA is one that motivates them to transcend into meaningful and long-lasting physics learning. This belief implies a sophisticated level of PLA awareness among the student groups. Both groups believe that an effective PLA is one that involves active learning where they are encouraged to think and investigate on their own. This is believed to be helpful in developing understanding and appreciation of the physical world.
6. Contrary to the teachers who believe that shorter time spent in a lesson is a consequence of an efficient PLA, most of the student groups explicitly

express a belief that is otherwise. These FGD groups reiterate that haste in covering lessons and giving of PLA wastes time and energy as this only results to superficial and transcient physics knowledge. Provision of longer time and more formative PLA forms and methods are believed to lead to a more meaningful and longer-retained physics understanding, hence, believed as efficient PLA components. Another common belief about PLA efficiency among the public and private SHS in this study is one that is centered on varied PLA. Variety in PLA forms, types and methods is believed by the students to be more responsive to their different learning styles which consequently leads to a deeper physics learning. This is believed to be indicative of an efficient PLA.

7. The most common category of description among the teachers of the public and private SHS is the the *structured* or "*law-abider*" conception of PLA. All of these teachers have formal education background and licenses as professional teachers. There is a strong belief in this teachers' conception of PLA that the meaning, purpose and process of PLA must be solely anchored and aligned on an existing educational policy or guideline such as the curriculum guide in General Physics 1 that is given by the government. Teachers having this conception of PLA believe that all the learning competencies in General Physics 1 based on the said document must be taught. Otherwise, the implemented PLA is deemed ineffective and inefficient. However, teachers also express that with the relatively high number of learning competencies that must be developed among the students and a relatively short contact time per session, they end up giving fast-paced traditional lecture, using readily-available PLA resources such

as charge-free electronic books with answers and solutions, and PLA forms that are generally problem-solving of defined and structured problems. Although there is nothing wrong in abiding policies and guidelines as it provides structure and order, it is deemed unproductive, however, when it leads to reinforcing surface learning instead of deep, integrative Physics learning (Aydeniz, 2007).

8. A teachers' formal education training and professional license for teaching do not necessitate high level or sophistication of awareness of PLA. In this study, all of the teachers who have the said profile characteristics have the lowest level of conception of PLA which is the structural or "law-abider", while the teacher who does not have the said qualifications have a higher level of conception of PLA which is the practical or "scientist-at-heart".
9. The least complete students' conception of PLA, the *(grade-focused)* "*grade-conscious*" conception shows the limited conception of students that PLA is for grading purposes only and not for meaningful and useful learning. This category of description is dominant to one student group only which is from the private SHS.
10. Both teachers from the public and private SHS acknowledge that there are too many learning competencies to develop among their students at a very limited time. This usually leads them to implement traditional instruction and PLA over a more social constructivist one and consequently results in superficial and reot-memory learning.
11. Both student groups from the public and private SHS are able to reach as their dominant conception the highest and most complete level of students' conception of PLA which is the *motivation-focused* or "*motivator*". This

shows that regardless of the type of SHS that the students may belong to, the preference for the kind of PLA that leads to a more meaningful, integrative and deep physics learning is common among the students.

12. The conceptual framework that is presented in this study may be used to determine and evaluate teachers' and students' levels of conception of PLA. This is a significant physics education research as it offers a framework for determining the level of sophistication and closeness to being social constructivist in perspective and approach of teachers' and students' conceptions of PLA. A social constructivist perspective of PLA is believed to promote deeper, more meaningful and integrative physics learning.
13. The conceptual model of teachers' and students' levels of PLA conceptions that is designed from this study offers a tool for self-evaluation among teachers and students.

Recommendations

Based on the conclusions of the study, the following are the recommendations:

1. For the General Physics teachers, this study recommends the adoption of the reflective or "conscientious" conception of PLA in their ways of understanding the meaning, purpose and process of PLA. This is characterized by the understanding that PLA is more than just policy adherence, nor provision of real-life practical experiences of students' physics learning. It is about an understanding that self-reflection is a component that is central in the meaning, purpose and method of PLA which enables a teacher to make

decisions on how to fully maximize whatever they have for the best learning of their students.

2. For the General Physics teachers, the adoption of the reflective conception of PLA is recommended as this responds to the students' highest level of PLA conception, the motivation-focused. This students' conception of PLA calls for a PLA whose meaning, purpose and process transcend the naive view of physics learning for high grades. The teachers' reflective conception of PLA also resonates with the said students' conception in the aspect of providing more non-graded, formative PLAs that are geared towards meaningful and deep physics learning.
3. For the General Physics teachers, this study recommends a leaning towards the reflective conception of PLA as this enables one to move away from the naive beliefs of PLA effectiveness. Contrary to the teachers' structural conception of PLA effectiveness and efficiency, the reflective conception is characterized by the belief that students' physics learning cannot be solely measured by the summative or graded PLAs but in a variety of engaging and motivating PLA forms. This shows that the teachers' reflective conception of PLA also responds to the students' motivation-focused conception as the latter also emphasizes effective PLA as one that is motivating to students.
4. For the General Physics teachers, the use of this study's conceptual model of teachers' levels of conceptions of PLA is recommended as one of their reflection points in determining their own conceptions of PLA. Determining one's dominant and less dominant conception(s) of PLA may be a helpful initial step in planning for concrete actions to transcend from a naive, least

social constructivist approach and low-level conception into a sophisticated, more social constructivist and high level one.

5. For the Teacher Education Institutes, the results from this study may be used as one of their bases in evaluating their pre-service teachers' curriculum in the context of its extent or level of being social constructivist in its paradigm and approach.
6. For the school administrators, this study recommends the provision of continuing in-service teachers' trainings that clearly and periodically explicate and clarify the essence, role and implications of an external educational policy or document such as the curriculum guide vis-a-vis the teachers' own understanding, beliefs, experiences and conceptions of it. A more social constructivist paradigm and approach to teaching, learning and assessing in physics and in general is recommended.
7. For the school administrators, this study recommends the utilization of the conceptual model of the levels of teachers' conception of PLA as one of their bases in evaluating their teachers' PLA conceptions. Data from this query may be used in planning and designing teachers' in-service trainings that promote the social constructivist perspective of learning, PLA and assessment in general.
8. For a meaningful and deep physics learning to become more possible within a limited time resource, this study recommends to the curriculum designers of the SHS physics education an evaluation for decongesting the breadth and depth of the learning standards in the General Physics 1 curriculum.
9. For Physics education researchers, a further study on the analysis of teachers' and students' conceptions of PLA, based on some socio-cultural

characteristics like native language, ethnicity, and cultural practices related to learning and teaching, especially in multi-cultural school communities may be conducted. A larger sample size, more senior high schools and inclusion of female teachers in the sample may be considered in future studies to widen its generalizability.

10. The number of interviews, FGDs and classroom observation may also be increased to at least three for each method to enhance data validity and reliability.

11. A quantitative study that determines and describes teachers' and students' conceptions of PLA may be conducted by designing an instrument which uses the three teachers' (*structural, practical* and *reflective*) and four students' conceptions of PLA (*grade-focused, socially-focused, real-life focused* and *motivation-focused*) that are revealed in this study. With the utilization of researcher-made survey questions, the sample size of teachers can be increased to at least thirty (30) and at least twenty (20) students for each teacher for parametric statistics to be used. The increased sample size increases reliability and validity of results. This may be done in describing teachers' and students' conceptions of PLA in much wider scope for greater generalizability.

12. To the educational researchers, this study recommends the utilization of the conceptual framework in conducting phenomenographic studies that are aimed at describing and exploring teachers' and students' levels of conceptions of PLA and assessment in general.

REFERENCES

Journals

Abell, S. K., & Volkmann, J. M. 2006. Seamless assessment in science: A guide for elementary and middle school teachers. Portsmouth, NH: Heinemann.

Adams P. 2006. Exploring social constructivism: Theories and practicalities. *Education* 34(3): 3–13.

Aikenhead, C. 1997. A framework for reflecting on assessment and evaluation. In *Globalization of science education* - Papers for the Seoul International Conference (pp. 195-199). Seoul: Korean Educational Development.

Akyol, Z., & Garrison, D. R. 2010. Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology*, 42(2), 233-250. doi:10.1111/j.14678535.2009.01029.

Allen, K., Sheve, J., and Nieter, V. 2011. Understanding Learning Styles: Making a Difference for Diverse Learners.

Althof, W., & Berkowitz, M. W. 2006. Moral education and character education: Their relationship and roles in citizenship education. *Journal of Moral Education*, 35(4), 495-518. doi: 10.1080/03057240601012204.

Anderberg, E. (2000). Word meaning and conceptions: An empirical study of relationships between students' thinking and use of language when reasoning about a problem. *Instructional Science*, 28, 89–113.

Anderson, D. R. 2000. Character education: Who is responsible? Journal of *Instructional Psychology*, 27, 139.

Anderson, Lorin W. & Krathwohl, David R. 2001. A Taxonomy for Learning, Teaching and Assessing: a Revision of Bloom's Taxonomy. New York. Longman Publishing.

Ashworth, P., & Lucas, U. 2000. Achieving empathyand engagement: a practical approach to the design, conduct and reporting of phenomenographic research. *Studies in Higher Education*, 25(3): 295-308.

Assessment and Reporting Unit Learning Policies Branch Office of Learning and Teaching. 2005. Current Perspectives on Assessment.

Aydeniz, M. 2007. Understanding the challenges to the implementation of assessment reform in science classroom: a case study of science teachers' conceptions and practices of assessment. UMI Microform 3263843. *ProQuest Information and Learning Company*.

Barnes, N., Fives, H. & Dacey, C. M. 2015. Teachers' beliefs about assessment. In H. Fives & M. G. Gill (Eds.), *International handbook of research* on teachers' beliefs (pp. 284–300). London: Routledge.

Black, P., & William, D. 1998. Assessment and classroom learning. *Assessment in Education: Principles, Policy, and Practice*, 5(1), 7-74.

Black, P.J., &Wiliam, D. 2009. Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 2009. 21(1): 5 31.

Brickhouse, N., W. 2006. Celebrating 90 years of science education: Reflections on the gold standard and ways of promoting good research. *Science Education*, 90 (1).

Brookhart, S. M. 2006. The art and science of classroom assessment: The missing part of pedagogy. Washington: *The George Washington University Press.*

Barnacle, R. 2005. Interpreting interpretation: A phenomenological perspective on phenomenography. In J. A. Bowden & P. Green. (Eds.), Doing developmental phenomenography (pp. 47–55). *Melbourne: RMIT University Press.*

Barnard, A., McCosker, H. & Gerber, R. 1999. Phenomenography: A qualitative research approach for exploring understanding in health care. *Qualitative Health Research,9*, 212-226.

Berliner, D. C. 2006. Our impoverished view of educational reform. *Teachers College Record,* 108(6), 949-995.

Berry R. 2008. Assessment for Learning. *Hong Kong University Press.*

Birenbaum, M. 2000. New Insights Into Learning and Teaching and Their Implications for Assessment. *First Conference of the Special Interest Group on Assessment and Evaluation of the European Association for Learning and Instruction* (EARLI), Maastricht, The Netherlands, Sept. 13, 2000.

Black, P. 2000. Research and the Development of Educational Assessment. *Oxford Review of Education*. Vol.26, Nos. 3&4, pp407-419.

Borman, K.M. 1996. Implementing Educational Reform: Sociological Perspectives on Educational Policy.

Black, P. & William, D. 1998. Assessment and classroom learning. *Assessment in Education*. Vol.5, pp.7-73.

Booth, S. A. 1992. Learning to program: A phenomenographic perspective. (*Göteborg Studies in Educational Sciences*, 89). Göteborg: Acta Universitatis Gothoburgensis.

Booth, S. A., & Ingerman, A. 2002. Making sense of Physics in the first year of study. *Learning and Instruction*, 12, 493–507.

Boon, S., Johnston, B. and Webber, S. 2007. A phenomenographic study of English faculty's conceptions of information literacy . *Journal of Documentation* Vol. 63 No. 2, 2007 pp. 204-228. © Emerald Group Publishing Limited 0022-0418 DOI 10.1108/00220410710737187

Brown, G., & Hirschfeld, G. 2005 . Secondary school students' conceptions of assessment :Conceptions of assessment and feedback. Project Report No. 4 . Auckland: University of Auckland.

Brown, G.T. and Hirschfeld, G.H. 2008. Students' conceptions of assessment: Links to outcomes.

Brown, G.T.L., Chaudhry, H. and Dhamija, R. 2015. The impact of an assessment policy upon teachers' self-reported assessment beliefs and practices: A quasi-experimental study of Indian teachers in private schools. *International Journal of Educational Research*, 71 (2015) 50–64

Bucks , G. and Oakes , W.C. 2011. Phenomenography as a tool for investigating understanding of computing concepts. *American Society for Engineering Education.*

Case, J., and Gunstone, R. 2002. Metacognitive development as a shift in approach to learning: An in-depth study. *Studies in Higher Education, 27*(4), 459-470.

Case, R., Demetriou, A., Platsidou, M., & Kazi, S. (2001). Integrating concepts and tests of intelligence from the differential and developmental traditions. *Intelligence, 29*, 307-326.

Campbell, E. (2003). The ethical teacher. Maidenhead, UK: *Open University Press/McGraw-Hill.*

Charles-Ogan, G. I. 2017. Effects of Mathematics Knowledge on Physics Students Performance in Electromagnetism. *International Journal of Theoretical and Mathematical Physics,* 7(4): 61-67 DOI: 10.5923/j.ijtmp.20170704.01.

Chi, M. T., Roy, M., & Hausmann, R. G. 2008. Observing tutorial dialogues collaboratively: Insights about human tutoring effectiveness from vicarious learning. *Cognitive Science,* 32(2), 301341. doi:10.1080/03640210701863396.

Chowdhury, M. 2016. Emphasizing Morals, Values, Ethics, And Character Education In Science Education And Science Teaching. *The Malaysian Online Journal of Educational Science* 2016.Volume 4 - Issue 2.

Cizek, G. J., Fitzgerald, S., Shawn, M. & Rachor, R. E. 1995. Teachers' assessment practices; preparation, isolation and the kitchen sink. *Educational Assessment*, 3, 159-179.

Cobb, P. 1994. Where Is the Mind? Constructivist and Sociocultural Perspectives on Mathematical Development. *Educational Researcher*, Vol. 23, No. 7, pp. 13-20.

Cope, C. 2004. Ensuring validity and reliability in phenomenographic research using the analytical framework of a structure of awareness. *Qualitative Research Journal*, Vol. 4, No. 2, 2004, pp. 5–18.

Cope, C. J. 2002. Educationally critical aspects of the concept of an information system. *Informing Science Journal*, 5, 67–78.

Cope, C. J., Horan, P., & Garner, M. 1997. Conceptions of information systems and their use in teaching about IS. *Informing Science Journal*, 1(1), 8–22.

Correia, M.S. and Freire, A.M. 2014. Physics and chemistry middle school teachers' conceptions and practices about assessment. *Investigações em Ensino de Ciências* – V19(2), pp. 403- 429, 2014.

Creswell, J., & Miller, D. 2000. Determining validity in qualitative inquiry. *Theory into Practice*, 39(3), 124–130.

Creswell, J. W. 2005. Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research. Pearson, Upper Saddle River.

Crouch, C. H., & Mazur, E. 2001. Peer instruction: Ten years of experience and results. *American Journal of Physics*, 69(9), 970977.

Darling-Hammond, L., & Young, P. 2002. Defining "highly qualified teachers": What does "scientifically based research" actually tell us? *Educational Researcher*, 31(9), 13-25.

Davidson, R.J., Jackson, D.C., Kalin, N.H. 2000. Emotion, plasticity, context, and regulation: Perspectives from affective neuroscience. *Psychological Bulletin*. 126:890–909.

Dayal, H. C. and Lingam, G. I. 2015. Fijian Teachers' Conceptions of Assessment. *Australian Journal of Teacher Education*, Volume 40, Issue 8, Article 3.

Delandshere, G. 2002. Assessment as inquiry. *Teachers College Record*, 104(7), 1461-1484.

Delfino, R. and Magno, C. 2012. Filipino College Students' Conception of Assessment. The *International Journal of Educational and Psychological Assessment*. December 2012, Vol. 12(1).

Denzin, N. K. & Lincoln, Y. S. 2000. *Handbook of qualitative research*. (2nd ed). Thousand Oaks, CA: Sage.

Deslauriers, L., Schelew, E. & Wieman, C. 2011. Improved Learning in a Large-Enrollment Physics Class. *Science*, 332(6031), 862–864.

Dick, D &Nicol, D. J. 2006. Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in higher education*, 31(2), 199218.

Dikko, M. 2016. Establishing Construct Validity and Reliability: Pilot Testing of a Qualitative Interview for Research in Takaful (Islamic Insurance). *The Qualitative Report* 2016 Volume 21, Number 3, Article 2, 521-528.

Ding, C. and Sherman, H. 2006. Teaching Effectiveness and Student Achievement: Examining the Relationship. *Educational Research Quarterly*.

Edwards, A. 2005. Let's get beyond community and practice: the many meanings of learning by participating, *The Curriculum Journal*, 16(1).

Ekeblad, E. 1996. Children, Learning, Numbers. A phenomenographic excursion into first-grade children's arithmetic. *University of Gothenburg, Gothenburg: Institution of Educational Science.*

Entwistle, N. 1997. Introduction: Phenomenography in higher education. *Higher Education Research & Development*, 16(2), 127-134.

Fletcher, R.B., Meyer, L.H., Anderson, H. et al. 2012. Faculty and Students Conceptions of Assessment in Higher Education. *High Educ* 64: 119. doi:10.1007/s10734-011-9484-1.

Frykholm, J. 1999. Assessment in mathematics teacher education: Introducing preservice teachers to assessment reform. *The Teacher Educator*, 34(4), 244-258.

Gavin T. L. Brown. 2004. Teachers' conceptions of assessment: implications for policy and professional development. *Assessment in Education*. Vol. 11, No. 3.

Genc, E. 2005. Development and validation of an instrument to evaluate science teachers' assessment beliefs and practices. Unpublished doctoral dissertation, Florida State University, Tallahassee.

Gerace, W. 2004. Assessing-To-Learn: Formative Assessment in Physics Instruction. *The Physics Teacher*. DOI: 10.1119/1.1804662.

Gioka, O. 2018. Assessment for learning in physics investigations: assessment criteria, questions and feedback in marking. *Physics Education*, Volume 41, Number 4.

Gipps, C. 1999. Socio-Cultural Aspects of Assessment. Review of Research in Education, Vol. 24 (1999), pp. 355-392 Published by: *American Educational Research Association Stable.*

Glasersfeld, E. von. 1989. Constructivism in education. In Husen T, Postlethwaite N (eds.), *The international encyclopedia of education research and studies,* Oxford: Pergamon Press. p. 162-163.

Green, J.M., Draper, A.K. & Dowler, E.A. 2003. Short cuts to safety: risk and 'rules of thumb' in accounts of food choice. *Health, Risk and Society* 5, 33–52.

Gumora G. and Arsenio W.F. 2002.Emotionality, emotion regulation, and school performance in middle school children. *Journal of School Psychology*.40:395–413.

Gurwitsch, A. 1964. The field of consciousness. Pittsburgh: Duquense University Press.

Hake, R. R. 1998. Interactive-engagement versus traditional methods: A six-thousand student survey of mechanics test data for introductory physics courses. *American Journal of Physics*, 66(1), 64–74.

Hanif, M., Sneddon, P.H., Al-Ahmadi, F.M. and Reid, N.2008 The perceptions, views and opinions of university students about physics learning during undergraduate laboratory work. *European Journal of Physics*, Volume 30, Number 1.

Hanks, W. F. 1991. Foreword. In J. Lave & E. Wenger (Eds.),Situated learning: Legitimate peripheral participation (pp. 13-26). *Cambridge: Cambridge University Press.*

Harlen, W. 2006. Assessment for learning and assessment of learning. In: Harlen, W. (Ed) *ASE Guide to Primary Science*. Hatfield: Association for Science Education.

Harrell, M.C. and Bradley, M.A. 2009. Data Collection Methods Semi-Structured Interviews and Focus Groups. *National Defense Research Institute*. Copyright 2009 RAND Corporation.

Hein G. E. 1991. Constructivist learning theory, the museum and the needs of people, paper presented at CECA (*International Committee of Museum Educators*) Conference, Jerusalem, Israel: 15–22 October.

Hoellwarth, C., Moelter, M. J. & Knight, R. D. 2005. A direct comparison of conceptual learning and problem solving ability in traditional and studio style classrooms. *American Journal of Physics*, 73(5), 459–463.

Huang, G., Taddese, N. & Walter, E. . 2000. U.S. Department of Education. National Center for Education Statistics. Entry and persistence of women and minorities in college science and engineering education. NCES 2000-061, by. Washington, DC: U.S. Department of Education.

Irving, P.W. and Sayre, E.C. 2013. Physics identity development: A snapshot of the stages of development of upper-level physics students. *Journal of the Scholarship of Teaching and Learning*, Vol. 13, No. 4, October 2013, pp. 68 – 84.

Johansson, B., Marton, F. and Svensson, L. 1985. "An approach to describing learning as change between qualitatively different conceptions", in West, T. and Pines, A. (Eds), *Cognitive Structure and Conceptual Change, Academic Press*, Orlando, FL.

John-Steiner, V. and Mahn, H. 1996.Sociocultural Approaches to Learning and: A Vygotskian Framework. *Educational Psychologist, 3l(3/4), 191-206.*

Kahn, E. A. (2000) A case study of assessment in a grade 10 English course. *The Journal of Educational Research,* 93, 276-286.

Kang, M. J., & Glassman, M. 2010. Moral action as social capital, moral thought as cultural capital. *Journal of Moral Education*, 39(1), 21-36. doi: 10.1080/03057240903528592.

Kavanagh, Y. and Raftery, D. 2017. Physical Physics- Learning and Assessing Light Concepts in a novel way. Volume 2, *Issue 63 International Materials Research Congress* XXVI, pp. 3933-3938.

Keys, C. W., & Bryan, L. A. 2001. Co-constructing inquiry-based science with teachers: essential research for lasting reform. *Journal of Research in Science Teaching*, 38(6), 631e645.

Kimball, S., M, White, B., Milanowski, A., & Borman, G. 2004. Examining the relationship between teacher evaluation and student assessment results in Washoe county. *Peabody Journal of Education*, 79(4), 54-78.

Klassen, S. 2006. Contextual assessment in science education: Background, issues, and policy. *Science Education,* 90(5), 820-851.

Krueger RA & Casey MA. 2000. Focus Groups: A Practical Guide for Applied Research, 3rd ed. Thousand Oaks, CA: *Sage Publications.*

Krueger, R.A.1994. Focus Groups: A Practical Guide for Applied Research. Thousand Oaks, CA: *Sage Publications.*

Kupermintz, H. 2002. Teacher effects as a measure of teacher effectiveness: Construct validity considerations in TVAAS. Los Angeles, CA: CRESST/University of Colorado, Boulder.

Larkin, T. L. 2011. Assessment of student understanding in physics: an integrated qualitative and quantitative approach. *American Society for Engineering Education*. AC 2011-997.

Larsson, J. & Holmström, I. 2009. Phenomenographic or phenomenological analysis: Does it matter? Examples from a study on anaesthesiologists work.

International Journal of Qualitative Studies on Health and Well-being. 2. 55-64. 10.1080/17482620601068105.

Laurillard, D., Charlton, P., Dimakopoulos, D., Ljubojevic, D., Magoulas, G., Masterman, E., and Whittlestone, K. 2013. A constructionist learning environment for teachers to model learning designs. *Journal of Computer Assisted Learning*, 29(1), 1530. doi:10.1111/j.13652729.2011.00458.

Lawrence, M., & Pallrand, G. J. 2000. A case study of the effectiveness of teacher experience in the use of explanation-based assessment in high school physics. *School Science and Mathematics*, 100(1), 36-47.

Limberg, L. 2000. Phenomenography: a relational approach to research on information needs, seeking and use. *The New Review of Information Behaviour Research*, 1: 51-67.

Limberg, L. 2008. Phenomenography. In L. Given (Ed.), The SAGE encyclopedia of qualitative research methods. (pp. 612-615). Thousand Oaks, CA: Sage. p. 611- 614.

Lincoln, Y., & Guba, E. 1985. Naturalistic inquiry. Beverly Hills, CA: Sage

Liu, J., Johnson, R. and Fan, X. 2016. A comparative study of Chinese and United States pre-service teachers' perceptions about ethical issues in classroom assessment. *Studies in Educational Evaluation*, 48 (2016) 57–66

Luttenberg, J., Van Veen, K. and Imants, J. 2013. Looking for cohesion: the role of search for meaning in the interaction between teacher and reform. *Research Papers in Education*, Volume 28, pp 289-308; doi:10.1080/02671522.2011.630746

Madsen, A., McKagan, S.A., Martinuk, M and Sayre, E. 2015. Research-based assessment affordances and constraints: Perceptions of physics faculty.

Marton F. 1994. Phenomenography. In: Husén T, Postlethwaite TN. (Eds). The international encyclopedia of education. (2nd ed.). Oxford: Pergamon Press; 1994. p. 4424-4429.

Marton, F. 2000. The structure of awareness. In J. Bowden & E. Walsh, (Eds.). Phenomenography. Melbourne: RMIT University Press. p. 102-116.

Marton, F. and Booth, S. 1997. Learning and awareness. Mahwah, NJ: Lawrence Earlbaum Association.

Micari, M., Light, G., Calkins, S., & Streitweiser, B. 2007. Assessment beyond performance: Phenomenography in educational evaluation. *American Journal of Evaluation*, 28(4), 458-476. doi: 10.1177/1098214007308024

Miller, M. 2000. Assessment: A Literature Review. *Research and Information Bulletin*. © Scottish Qualifications Authority. Bulleting Number 19.

Minick, N. 1989. L. S. Vygotsky anti Soviet activity theory: Perspectives on the relationship between mind and society. *Literacies Institute, Special Monograph Series No. 1*. Newton, MA: Educational Development Center, Inc.

Monette, D.R., T.J. Sullivan and C.R. DeJong. 2002. *Applied Social Research*. Orlando, FLA: Harcourt Press.

Moore, F. M. 2004. Professional development and poststructural analysis: Stories of African American science teachers. Unpublished doctoral dissertation, Florida State University, Tallahassee, FL.

Mouton, J., & Marais, H. C. 1996. Basic concepts in the methodology of the social sciences. Pretoria, South Africa: HSRC Publishers.

Motlhabane, A. 2016. Learner's alternative and misconceptions in physics: A Phenomenographic study. *Journal of Baltic Science Education*, Vol. 15, No. 4, 2016. ISSN 1648–3898.

NEA. 2011. Beyond Two Test Scores: Multiple Measures of Student Learning and School Accountability. NEA Education Policy and Practice Department | Center for Great Public Schools | 1201 16th St., NW, Washington, D.C. 20036

Orgoványi-Gajdos, J. 2015. Expert and novice techers' approaches to problematic pedagogical classroom situations. 2-4 February 2015- Istanbul, Turkey Proceedings of INTCESS15- 2 nd International Conference on Education and Social Sciences.

Ornek, F. 2008. An overview of a theoretical framework of phenomenography in qualitative education research: An example from physics education research. *Asia-Pacific Forum on Science Learning and Teaching*, Volume 9, Issue 2, Article 11, p.1.

Otero, V.K. and Harlow, D.B. (year not indicated). Getting Started in Qualitative Physics Education Research. University of Colorado and Gevirtz Graduate School of Education, University of California, Santa Barbara, CA.

Özcan, Ö. 2010. How do the Students Describe the Quantum Mechanics and Classical Mechanics? *Latin American Journal of Physics Education*. Vol. 4, No. 1.

Packer, M. J., & Goicoechea, J. 2000. Sociocultural and constructivist theories of learning: ontology, not just epistemology. *Educational Psychologist*, 35 (4), 227-242.

Palm, T. 2008. Performance Assessment and Authentic Assessment: A Conceptual Analysis of the Literature. *Practical Assessment, Research and Evaluation*. Volume 13, Number 4, April 2008.

Pastore, S. S. &Pentassuglia, M. 2016. Teachers' and students' conceptions of assessment within the Italian higher education system. *Practitioner Research in Higher Education Special Assessment* Issue Copyright © 2016 University of Cumbria Vol 10(1) pages 109-120.

Patton, M. 1990. Qualitative evaluation and research methods (pp. 169-186). Beverly Hills, CA: Sage.

Pekrun R, Goetz T, Perry RP, Kramer K, Hochstadt M, Molfenter S. 2004. Beyond test anxiety: Development and validation of the Test Emotions Questionnaire (TEQ) Anxiety, Stress, & Coping: An International Journal. 17:287–316.

Peterson, E.R. and Irving, S.E.2008. Secondary school students' conceptions of assessment and feedback.

Prince, M. 2004. Does Active Learning Work? A Review of the Research. *Journal of engineering education*, 93(3), 223-231.

Prosser, M. 2000. Phenomenographic research in teaching and learning. In J. Bowden & E. Walsh, (Eds.). Phenomenography. Melbourne: RMIT University Press. p. 34-46.

Rabiee, F. 2004. Focus-group interview and data analysis. Proceedings of the Nutrition Society (2004), 63, 655–660.

Rands, M.L. and Gansemer-Topf, A.M. 2014. Phenomenography: A Methodological Approach for Assessing Student Learning in Student Affairs. *The Journal of Student Affairs Inquiry*.

Reese, H. W. 2011. The Learning-by-Doing Principle. *Behavioral Development Bulletin*. Volume 11, 2011 ISSN: 1942-0722.

Richardson, J. 1999. The concepts and methods of phenomenographic research. *Review of Educational Research*. Spring 1999. Vol. 69, No. 1, pp. 53-82.

Rothbart MK, Bates JE. 2006.Temperament. In: Damon W, Eisenberg N, editors. *Handbook of child psychology*. Vol. 3. Social, emotional, personality development. 6th ed. Wiley; Hoboken, NJ: pp. 99–166. Series Ed.

Ryan, A. 1988. Program evaluation within the paradigm: Mapping the territory. Knowledge: Creation, Diffusion, Utilization, 10, 25.

Ryan, G. and Bernard, H. 2000. Handbook of Qualitative Research. *Sage, Thousand Oaks*.

Sadler, R. 1998. Formative assessment: Revisiting the territory. *Assessment in Education*, 5, 77-84.

Säljö, R. 1988. Learning in educational settings: Methods of inquiry. In P. Ramsden (Ed.), Improving learning. New perspectives (pp. 32–48). London: Kogan Page.

Sambell, K., McDowell, L., & Brown, S. 1997. "But is it fair?": an exploratory study of student perceptions of the consequential validity of assessment. *Studies in Educational Evaluation*, 23 (4), 349-371.

Sardareha, S.A. and Mohd Rashid Mohd Saadb, M.R. 2012. A Sociocultural Perspective on Assessment for Learning: The Case of a Malaysian Primary School ESL Context. *Procedia - Social and Behavioral Sciences* 66 (2012) 343 – 353.

Schommer, M. and Walker, K. 1995. Are epistemological beliefs similar across domains? *Journal of Educational Psychology*, Vol 87(3), Sep 1995, 424-432.

Schwager, M. T. 1994. Paradigms of Assessment: What is Authentic Assessment in Your World View? UMI. A Bell & Howell Information Company 300 North Zeeb Road. Ann Arbor. MI 48106-1346 USA 313/761-4700 800/521-0600

Scouller, K. 2006. The influence of assessment method on students' learning approaches: Multiple choice question examination versus assignment essay. *Higher Education* 35: 453–472, 1998.

Sekaran, U. 2003. Research methods for business: A skill building approach (4th ed.). Hoboken, NJ: John Wiley and Sons.

Segers, M., Dochy, F., Cascallar, E. (eds). (2003). Optimising New Modes of Assessment: In Search of Qualities and Standards, Kluwer Academic Publishers, Dordrecht.

Shepard, L, A. 2000. The role of classroom assessment in teaching and learning. *Educational Researcher*, 29(7), 4-14.

Scott, T., Gray, A. & Yates, P. 2013. A controlled comparison of teaching methods in first-year university physics. *Journal of the Royal Society of New Zealand*, 43(2), 88–99.

Silcock, P. 2003. Accelerated learning: A revolution in teaching method?, *Education* 3–13, 31 (1): 48–52.

Sin,S. 2010. Considerations of Quality in Phenomenographic Research. *International Journal of Qualitative Methods*. Sweden.

Skott, J. 2015. The Promises, Problems, and Prospects of Research on Teachers' Beliefs. In H. Fives & M. G. Gill (Ed.), *International Handbook of Research* on *Teachers' Beliefs* (pp. 13-31). Routledge Taylor &Francis Group: New York and London.

Stiggins, R. J. 2004. New assessment beliefs for a new school mission. *Phi Delta Kappan* 86(1), 22-27.

Slater, T.F., Ryan, J.F. and Samson, S.L. 1997. Impact and dynamics of portfolio assessment and traditional assessment in a college physics course. *Journal of research in Science teaching*. Volume 34, Issue 3. March 1997.Pages 255-271.

Stobart G. 2008. Testing times: The uses and abuses of assessment. New York, NY: Routledge.

Struyven, K., Dochy, F. and Janssens, S. 2002. Students' Perceptions about Assessment in Higher Education: a Review. Paper presented at the Joint Northumbria/ Earli SIG Assessment and Evaluation Conference: Learning communities and assessment cultures, University of Northumbria at Newcastle, 30 August 2002.

Sutherland R., Armstrong V., Barnes S., Brawn R., Breeze N., Gall M., Matthewman S., Olivero F., Taylor A., Triggs P., Wishart J. & John P. 2004. Transforming teaching and learning: Embedding ICT into everyday classroom practices, *Journal of Computer Assisted Learning* 20: 413–425.

Suzuk, E. and Ogan-Bekiroglu, F. 2012. Pre-service physics teachers' intentions toward classroom assessment. International Conference on Education and Educational Psychology (ICEEPSY 2012). *Procedia - Social and Behavioral Sciences*, 69 (2012) 854 – 863.

Svensson, L. 1997. Theoretical Foundations of Phenomenography. *Higher Education Research & Development*, 16(2): 159-171.

Tan, K.H. 2012. Variation in teachers' conceptions of alternative assessment in Singapore primary schools. *Education Research International*, Volume 2012, Article ID 382465,

Thacker, B., Kim, E., Trefz, K. & Lea, S. M. 1994. Comparing problem solving performance of physics students in inquiry-based and traditional introductory physics courses. *American Journal of Physics*, 62(7), 627–633.

Thomas L, MacMillan J, McColl E, Hale C & Bond S (1995) Comparison of focus group and individual interview methodology in examining patient satisfaction with nursing care. *Social Sciences in Health* 1, 206–219.

Thompson, A. 1992. Teachers' beliefs and conceptions: A synthesis of the research. In D. Grouws (Ed.), Handbook of research on mathematics teaching and learning (pp. 127–146). New York, NY: Macmillan.

Tinell, R., Asikainen, M.A. and Hirvonen, P.E. 2017. Learning assessment views and perceptions of Finnish teachers and international students in post-graduate physics studies. *Problems of Education in the 21st Century*. Vol. 75, No. 3, 2017.

Tittle, C. K. 1994. Toward an educational psychology of assessment for teaching and learning: theories, contexts, and validation arguments. *Educational Psychologist*, 29, 149-162.

Torrance, H., & Pryor, J. 1998. Investigating formative assessment: Teaching, learning and assessment in the classroom. Buckingham, England: Open University Press.

Towndrow, P.A., Tan, A.L., Yung, B.H.W. and Cohen, L. 2010. Science Teachers' Professional Development and Changes in Science Practical Assessment Practices: What are the Issues? *Research in Science Education*, Volume 40, Issue 2, pp 117–132

Trigwell, K. 2000. A phenomenographic interview on phenomenography. In *J. Bowden & E. Walsh (Eds.),*Phenomenography(pp. 63-82): Melbourne: RMIT University Press.

Trigwell, K., Prosser, M., & Taylor, P. 1994. Qualitative differences in approaches to teaching first year university science. *Higher Education*, 27, 75–84.

Uljens, M. (1996). On the philosophical foundations of phenomenography. In G. Dall'Alba, & B. Hasselgren (Eds.), Reflections on Phenomenography (pp. 103128). Go¨teborg: Acta universitatis Gothoburgensis.

Uzunboylua, H. and Aşıksoyb, G. 2014. Research in Physics Education: A Study of Content Analysis. *Procedia - Social and Behavioral Sciences* 136 (2014) 425 – 437.

Van den Berg, B. 2002. Teachers' meanings regarding educational practice. *Review of Educational Research*, (72), 577-625.

Van Wyk, B., 2017. Research design and methods part I. University of the Western Cape.

Vatterott, C. 2015. Rethinking Grading: Meaningful Assessment for Standards-Based Learning.

Vygotsky, L. S. 1978. Mind and society: The development of higher psychological processes. Cambridge: Harvard University Press.

Vygotsky L. S. 1986. Thought and language .A. Kozulin, Ed. and Trans.Cambridge MA, MIT Press.

Wagetti, R., Johnston, P., and Jones, L. Education, v137 n4 p393-397 Sum 2017. (EJ1144327), Database: ERIC

Walsh, E. 2000. Phenomenographic analysis of interview transcripts. In J. A. B. E. W. (Eds.) (Ed.), Phenomenography. Melbourne,Australia: RMIT University. 19-33

Wasserstcin, P. 1995. What middle schoolers say about their schoolwork. Educational Leadership, 53,4143.

Wiggins, G., & McTighe, J. 1998. *Understanding by design* .Alexandria, VA: Association for Supervision and Curriculum Development.

Wiggins, G. 2011. A True Test: Toward More Authentic and Equitable Assessment. *Phi Delta Kappan International*. Vol 92, Issue 7, 2011.

Wiliam, D. 2011. What is assessment for learning? *Studies in Educational Evaluation*. 37(1): 3-14.

Wilson, B.G. 1996. Constructivist Learning Environments: Case Studies in Instructional Design. *Educational technology Prublications*. Englewood Cliffs, New Jersey.

Wu, W. 2016. Relationship between science teachers' conceptions of assessment of students' academic performance and their instructional approaches. *Contemporary Trends and Issues in Science Education*, Volume 45 ,17 August 2016. pp 259-293

Yair, G. 2000. Educational battlefields in America: The tug-of-war over students' engagement with instruction. *Sociology o f Education*, 73(4), 247-269.

Books

Bruce, C. (1997). The seven faces of information literacy. Adelaide: Auslib Press.

Carlson, R. (1997). Experienced Cognition. New York: Lawrence Erlbaum Associates.

Marton, F. and Booth, S. (1997). *Learning and Awareness*. Mahwah, N.J.:L. Erlbaum Associates.

Sandberg, J. (1994). Human competence at work: An interpretivist approach.Goteborg University, Sweden: Bas.

Singer, M. 1968. Culture. Int. Encycl. Soc. Sci. 3: 527-43.

Internet sources

Bricki, N. and Green, J. 2018. A Guide to Using Qualitative Research Methodology. MSF Field Research. Retrieved from http://hdl.handle.net/10144/84230.

Brown, G. T. L., Kennedy, K. J., Fok, P. K., Chan, J. K. S., & Yu, W. M. (2009). Assessment for improvement: Understanding Hong Kong teachers' conceptions and practices of assessment. Assessment in Education: Principles, Policy and Practice, 16(3), 347–363. Retrieved from http://dx.doi.org/10.1080/09695940903319737

Center for Evaluation and Research. 2011. Pilot Testing Data Collection Instruments. Retrieved from http://programeval.ucdavis.edu

Cope, C. J. (2000). Educationally critical aspects of the experience of learning about the concept of an information system, Unpublished doctoral dissertation, La Trobe University, Australia. Retrieved May 17, 2004 from http://ironbark.bendigo.latrobe.edu.au/~cope/cope-thesis.pdf

Craw, K. G. (2009). Performance assessment practices: a case study of science teachers in a suburban school setting. UMI Microform 3368395. Copyright by ProQuest LLC.

Darling-Hammond, L. (2003). Standards and assessment: Where we are and what we need, Teachers College Records. [On-line]. Retrieved from www.tcrecord.org/Content.asp?ContentID=11109

Darling-Hammond, L. and Falk, B. (2013). Teacher learning through assessment how student-performance assessments can support teacher learning. Retrieved from https://www.americanprogress.org/wp-content/uploads/2013/09/TeacherLearning.pdf

Department of Education Order No. 8, s. 2015. Retrieved from http://www.deped.gov.ph/sites/default/files/order/2015/DO_s2015_08.pdf

Dumford, A., Ribera, A. and Laird, T. 2015. A look within: STEM faculty emphasizing deep approach to learning. Retrieved from http://nsse.indiana.edu/pdf/presentations/2015/AIR_Forum_2015_Dumford_Ribera_Laird_poster.pdf

Etkina, E., Karelina, A., Ruibal-Villasenor, M., Rosengrant, D., Jordan, R. & Hmelo-Silver, C.E. 2010. Design and Reflection Help Students Develop Scientific Abilities: Learning in Introductory Physics Laboratories. Pages 54-98 | Published online: 25 Jan 2010.

Forehand, M. (2005). Bloom's taxonomy: Original and revised. Retrieved from http://epltt.coe.uga.edu/

Cambridge, Massachusetts, USA. Retrieved from http://dl.acm.org/citation.cfm?id=1013152

Hole, G. Research Methods 1 Handouts. COGS - version 1.0, September 2000: Page 1: Retrieved from http://users.sussex.ac.uk/~grahamh/RM1web/sthand1.pdf

Huba, M. and Freed, J. (2000). Learner-Centered Assessment on College Campuses: Shifting the Focus from Teaching to Learning. Retrieved from http://uncw.edu/cas/documents/LearnerCenteredAssessement.pdf

James, M. 2006. Assessment, Teaching and Theories of Learning. Retrieved from https://www.researchgate.net/publication/271964452.

Kauertz, A. and Fischer, H.E.2006. Assessing Students' Level of Knowledge and Analysing the Reasons for Learning Difficulties in Physics by Rasch Analysis. Retrieved at ResearchGate. https://www.researchgate.net/publication/281345380.

Keesing, R. M.. 1974. THEORIES OF CULTURE Institute of Advanced Studies, Australian National University Cdoberra A.C.T., Australia. Retrieved from http://kodu.ut.ee/~cect/teoreetilised%20seminarid_2009%20s%C3%BCgis/1_seminar_KULTUUR_29.09.2009/text_1.pdf

Kvale, S. (1996). InterViews. London: Sage.Center for Evaluation and Research. 2012. Tips & Tools #18: Coding Qualitative Data. Tobacco Control Evaluation Center. Retrieved from file:///C:/Users/admin/Desktop/Dissertation%20stuff/A.%20January%202018%20updates/must-know%20for%20writing/coding.%20analysis.pdf

Lee, A.M. 2013. Informal Assessment: What do I know about it? Retrieved from https://annemichellemlee88.wordpress.com/2013/01/24/informalassessmentwhatdoiknowaboutit/

Madsen, A., McKagan, S., Martinuk, M.S., Bell, A. and Sayre, E. (2016). Research-based assessment affordances and constraints: Perceptions of physics faculty. *Physics Review Physics Educational Research.* Retrieved from http://journals.aps.org/prper/abstract/10.1103/PhysRevPhysEducRes.12.010115

Mansilla, V.B. and Gardner, H. (1998). What are the qualities of understanding? Retrieved from https://cte.ku.edu/sites/cte.drupal.ku.edu/files/docs/portfolios/bjohnson/table1_four_dimensions.pdf

McAlpine, M. (February 2002). Principles of Assessment. Bluepaper Number 1.Robert Clarke Centre for technological Education. University of Glasgow. Retreived from http://caacentre.lboro.ac.uk/dldocs/Bluepaper1.pdf

Meyer, H. 2004. Novice and Expert Teachers' Conceptions of Learners' Prior Knowledge Teacher Education, University of Cincinnati, ML0002, Cincinnati, OH 45221, USA.

Published online 26 August 2004 in Wiley InterScience. Retrieved from https://pdfs.semanticscholar.org/bfda/da396b6be59b1d3ef5c3fb233afd3a498 0d7.pdf

Meriam-Webster Dictionary. Retrieved from https://www.merriam webster.com/dictionary/experience

Orgill, M. K. (2002). Phenomenograpy. Retrieved January, 2008 from http://www.minds.may.ie/~dez/phenom.html

Ornek, F. 2008. An overview of a theoretical framework of phenomenography in qualitative education research: An example from physics education research. Asia-Pacific Forum on Science Learning and Teaching, Volume 9, Issue 2, Article 11 (Dec., 2008). Retrieved from https://www.eduhk.hk/apfslt/v9_issue2/ornek/ornek2.htm

RA 10533. Retrieved from http://www.gov.ph/2013/05/15/republic-act-no-10533/

Shumba, O. 1994 Interaction of socio-cultural backgrounds and beliefs with conceptions of the nature of science, societal issues, and instructional ideology among secondary science teachers in Zimbabwe. Iowa State University. Digital Repository. Retrieved from https://lib.dr.iastate.edu/cgi/viewcontent.cgi?referer=https://www.google.com.ph/&httpsredir=1&article=12321&context=rtd

Volpe, M. 2016. Completing your qualitative dissertation. SAGE Publications. Retrieved from https://www.sagepub.com/sites/default/files/upm-binaries/47686_ch_1.pdf

Webber, S. and Johnston, B. 2015. An introduction to phenomenographic research. Retrieved from http://slideshare.net/sheilawebber/an-introduction-to-phenomenographic-research

Yates, C., Partridge, H. and Bruce, C. (2012). Exploring information experiences through phenomenography. Library and Information Research Volume 36 Number 112 2012. Retrieved from http://www.lirgjournal.org.uk/lir/ojs/index.php/lir/article/viewFile/496/552&sa=U&ei=GnZTU_GJBoiy2wWan4CIDQ&ved=0CFAQFjAJ&usg=AFQjCNFdJlk1Tm322cKJZLrHNZy3ICo2qA

APPENDIX A

PROFILE SHEET FOR TEACHERS
(Instrument #1)
(For Research Question #1)

Confidentiality
All information that is gathered in this study will be kept completely confidential. While the results of this research may be published or discussed in conferences, no information that would reveal your identity and all information that you have shared will be included.

About the Questionnaire

- This questionnaire is used to collect data about the socio-cultural characteristics of the teacher-informants who are participating in the research study entitled: *"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment"*.
- This has three major parts which are as follows: *Personal Information, Educational Background/Professional Development and Employment Background.*
- This questionnaire can be answered in less than five (5) minutes only.
- In most items, boxes are provided for the choices and the one corresponding to your most appropriate answer must be ticked/checked. In some items, a space is provided for your input. In these cases, please answer as best as you can.
- When in doubt about any part of the questionnaire or the study, you can reach the researcher by phone at the following numbers: [0923 -8287757; 221-2411 Local 8414]

Thank you very much for your cooperation!

PERSONAL BACKGROUND

1. What is your gender?
   - ☐ Female
   - ☐ Male
2. How old are you?
   - ☐ 20 – 25
   - ☐ 26- 30
   - ☐ 31 – 35
   - ☐ 36 – 40
   - ☐ 41 – 50
   - ☐ 50+

3. What is your civil status?
   - ☐ Single
   - ☐ Married
   - ☐ Annuled
   - ☐ Separated
   - ☐ Single-parent
   - ☐ Widow

EDUCATIONAL BACKGROUND AND PROFESSIONAL DEVELOPMENT

4. What is your highest educational attainment?
   - ☐ Baccalaureate degree
   - ☐ Master's degree
   - ☐ Doctorate degree

   For the corresponding answer in number (4), please indicate the specific program that you have completed: ______________________________

5. Are you a licensed professional teacher?
   - ☐ Yes.
   - ☐ No, but I am working on taking the licensure examination for teachers within this year.
   - ☐ No, and no urgent plans of taking the licensure examination for teachers in the next three years.
   - ☐ No, but I have another professional license for ______________________.

6. When was the last time you attended an activity for professional development?
   - ☐ 1 to 5 months ago
   - ☐ 6 to 12 months ago
   - ☐ 13 to 24 months ago
   - ☐ 1 to 3 years ago
   - ☐ More than 3 years ago

EMPLOYMENT BACKGROUND

7. How long have you been teaching? (Please sum up your total years of teaching in all schools that you have taught including the current one.)
   - ☐ 1 – 5 years
   - ☐ 6 – 10 years
   - ☐ 10- 15 years
   - ☐ 16 – 20 years
   - ☐ 20 years and above

8. What is the category of the Senior High School that you are teaching now?
   - ☐ Government-run/Public
   - ☐ Private – Sectarian
   - ☐ Private – Non-Sectarian
9. What is your teaching status in your school now?
   - ☐ Full-time
   - ☐ Part-time (50% -90% of full-time hours)
   - ☐ Part-time (less than 90% of full-time hours)
   - ☐ Substitute teacher: Length of time for substitution: ____________
10. What is your employment status in your school now?
   - ☐ Regular/Permanent employment
   - ☐ Probationary: with fixed contract for a period of 1 year
   - ☐ Probationary: with fixed contract for a period less than 1 year

****

---The information sheet ends here. Thank you very much for your participation!--

APPENDIX B

PROFILE SHEET FOR STUDENTS
(Instrument #2)
(For Research Question #1)

Confidentiality

All information that is gathered in this study will be kept completely confidential. While the results of this research may be published or discussed in conferences, no information that would reveal your identity and all information that you have shared will be included.

About the Questionnaire

- This questionnaire is used to collect data about the socio-cultural characteristics of the students who are participating in the research study entitled: *"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment".*
- This has two major parts which are as follows: *Personal Information* and *Educational Background.*
- This questionnaire can be answered in less than five (5) minutes only.
- In most items, boxes are provided for the choices and the one corresponding to your most appropriate answer must be ticked/checked. In some items, a space is provided for your input. In these cases, please answer as best as you can.
- When in doubt about any part of the questionnaire or the study, you can reach the researcher by phone at the following numbers: [0923 -8287757; 221-2411 Local 8414]

Thank you very much for your cooperation!

PERSONAL BACKGROUND

1.What is your gender?
- ☐ Female
- ☐ Male

2. How old are you?
- ☐ 15 – 16
- ☐ 17- 18
- ☐ 19 – 20
- ☐ 21 – 25
- ☐ 25+

3. What is your civil status?
- ☐ Single
- ☐ Married
- ☐ Annuled
- ☐ Separated
- ☐ Single-parent
- ☐ Widow

4.Are you a recipient of any scholarship grant?

☐Yes. (*For this response, please specify the nature of the scholarship:

☐Government- voucher

☐Government- Education Service Contract (ESC)

☐Private Agency/Person

☐School grant-in-aid

☐No.

EDUCATIONAL BACKGROUND

1. Have you received an award(s) upon completing Junior High School?
   ☐Yes. (Please specify): ______________________
   ☐No.
2. Was going to STEM strand in the academic track your personal choice?
   ☐Yes.
   ☐No.
3. What are you planning to do after Senior High School?
   ☐Proceed to higher education. (*For this response, please specify the program/course that you intend to take in college: ______________
   ☐Start my own business.
   ☐Get employed and work.
   ☐I am not sure.
4. What is the category of the Senior High School that you are studying in now?
   ☐Public/National High School
   ☐Private – Sectarian High School
   ☐Private – Non-Sectarian High School
5. Do you like learning about Physics?
   ☐Yes.
   ☐No.

****

---The information sheet ends here. Please return this to the researcher.

Thank you very much for your participation!--

APPENDIX C

KEY INFORMANT INTERVIEW (KII) GUIDE

(Instrument #3)

(For Research Questions 2 to 5)

Notes/Protocols:

1. The interviewer does the following preliminaries:

a. Collect the consent form the informant. This formis completed in advance by the informant.

2. The interviewerdoes the following:

a. Introduction

1. Introduce, once again, her name, institutional affiliation, title and purpose of the study.

b. Explanation of the process

Interviewer explains to theinformantthe following:

1. With the permission of the informant, through a written consent, the interview is audio-recorded for data retrieval and analysis.

2. Informant'sidentityis held confidential.

3. The *"confirmation"* stage (the second stage ofthe enhanced phenomenography method for data analysis) is embedded within the interview. This is done throughout the discussion by the researcher-interviewer constantly clarifying with the informanthis/her shared conceptions so that both "arrive at a mutual understanding of the shared personal accounts" (Orgill, 2002). This part also serves as the informant's owning of his/her shared accounts. Once this is achieved, the answers are considered final and are part of the data of the study.

c. Actual interview

Interviewer gives time for informant to answer the questions. If a question is not clear, interviewer translates the question in Filipino or Visayan which are the commonly-spoken dialects in the research locale.

Opening question: What lessons/topics so far have you taught in your Gen. Physics 1 class?

Main Questions:

I. Understanding on Physics Learning Assessment

1. What comes into your mind when you hear the word '*assessment*'?
2. When can you say that a student has gained Physics learning in a certain lesson?
3. What do you mean by Physics learning assessment in general?
4. What should Physics learning assessment consist of?
5. Who should be doing the Physics learning assessment and why?
6. Why should Physics learning assessment be done?
7. How should these areas in Physics learning be assessed?

II. Beliefs on Physics Learning Assessment

8. What do you believe is an effective Physics Learning Assessment?
9. If you are to rate the effectivity of the Physics Learning Assessment that you are implementing now between one to ten, one being the lowest, what would it be and why?
10. What do you believe is an efficient Physics Learning Assessment?
11. If you are to rate the efficiency of the Physics Learning Assessment that you are implementing now between one to ten, one being the lowest, what would it be and why?

III. Experiences of Physics Learning Assessment

12. What is your most significant storyso far as you experience implementing Physics Learning Assessment in your General Physics 1 class?
13. What makes this story the most significant for you?

14. How did you feel during that experience?

15. What insight(s) have you gained from the said significant experience of Physics Learning Assessment?

3. Wrapping up process

Interviewer wraps up the discussion by doing the following:

1. Ask the informant for any additional comments before the discussion is officially ended.

2. End the interview by thanking the informant for his/her active participation and valuable contribution to the study.

APPENDIX D

FOCUS GROUP DISCUSSION (FGD) GUIDE FOR STUDENT-PARTICIPANTS

(For Research Questions 2 to 5)

Notes/Protocols:

1. The facilitator does the following preliminaries:

   a. Collect the consent forms (parents' consent and students' informed assent) from the participants. These forms are completed in advance by all those seeking to participate.

   b. Ask the participants to sign the sign-in sheet for their attendance.

   c. Serve snacks and refreshments to the participants.

2. The facilitator facilitates the FGD as follows:

a. Introduction

Facilitator introduces her name, institutional affiliation, title and purpose of the study.

b. Explanation of the process

Facilitator explains to participants the following:

1. Focus group is used in educational researches to gather in-depth information from the participants. Achieving consensus in the group is not the goal of the FGD but gathering information only.

2. There are no right or wrong answers. Questions are descriptive and exploratory, hence, probing is necessary/encouraged.

3. The FGD may last about one to two hours at most. All participants are highly encouraged to reflect on their experiences and relate these personal accounts to the group as clearly as possible.

4. The FGD is audio-recorded for data retrieval and analysis.

5. Participants' identities are held confidential.

6. The "*confirmation*" stage (the second stage ofthe enhanced phenomenography method for data analysis) is embedded within the FGD. This is done throughout the discussion by the researcher-facilitator constantly clarifying with the participants their shared conceptions so that both "arrive at a mutual understanding of the shared personal accounts" (Orgill, 2002). This part also serves as the participants' owning of their shared accounts. Once this is achieved, the answers are considered final and are part of the data of the study.

c. Actual discussion

Facilitator gives time for participants to answer the questions. If a question is not clear to participants, facilitator translates the question in Filipino or Visayan which are the commonly-spoken dialects in the research locale.

Questions:

(Ice-breaker/Opening)

1. What is your name?
2. Why did you choose STEM as your academic track in the SHS?
3. What activities have you been doing in class so far in order to learn about your Physics lessons?

(FGD Proper)

Understanding...

1. What comes into your mind when you hear the word "assessment"?
2. In your gen. physics 1 class, when can you say that you have gained physics learning?
3. How do you understand the term "physics learning assessment"?

4. In your own understanding, who should assess your Physics learning and why?
5. What is the purpose of PLA?
6. How should PLA be done?

Beliefs on effectivity and efficiency of PLA

7. In your own beliefs, what is an effective PLA?
8. If you are to rate the effectivity of the Physics Learning Assessment that you are experiencing now between one to ten, one being the lowest, what would it be and why?
9. How do you understand the word "efficiency"?
10. In your own beliefs, what is an efficient PLA?
11. If you are to rate the efficiency of the PLA that you are experiencing now between one to ten, one being the lowest, what would it be and why?

Experiences of PLA

12. What is your most significant story so far in your experiences of PLA?
13. What makes this story significant for you?
14. How did you feel during that experience?
15. What insight/s did you have on that significant experience of PLA?

3. Wrapping up process

Facilitator wraps up the discussion by doing the following:

A. Ask the group for any additional comments before the discussion is officially ended.

B. End the focus group discussion by thanking the participants for their active participation and valuable contribution to the study.

APPENDIX E
Letter of Permission to Experts for
Instruments Validation

(Date)

____
____
____

Re: Request for an Expert Opinion for the Enhancement of Research Intruments
(Dissertation)

Dear Sir/Ma'am:

Greetings of peace to you!

I, the undersigned, is currently doing my dissertation for the program Doctor of Philosophy in Physics Education at the University of the Philippines – Open University. My study is entitled: *"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment"*. My dissertation advisor is Dr. Vivien Talisayon from UP – Diliman. The study is qualitative and exploratory, hence, data will be gathered through semi-structured interviews for the Senior High School teacher-informants and focus group discussion (FGD) for the student-participants.

In view of the above, I am writing to express my request for your expert opinion for the content and structure validity of my four instruments: Socio-Cultural Profile Sheet for Teachers, Socio-Cultural Profile Sheet for Students, Key Informant Interview (KII) guide, and FGD guide (copies attached). Also attached is a copy of the Statement of the Problem for your reference. I humbly ask for your recommendations and suggestions for the enhancement of the said instruments through your lens as a seasoned educator and researcher. Your input will be of tremendous help.

Should you grant your approval to this request, kindly fill out the attached reply form. You may write your comments directly on the provided hard copies and I will retreive it at your most convenient time. I am further praying for your consideration, however, that I may be able to retrieve the manuscript with your recommendations and suggestions on it before the targeted date for the piloting of the intruments at the middle part of July 2017. My apologies for this dare plea. The actual data gathering is set on the last week of July 2017 until the end of October 2017 (end of the first semester of the current school year).

Your valuable contribution will be cited and acknowledged in the final paper at the completion of this study. There is no payment for the said contribution, however, a simple token of gratitude and appreciation will be given.

Should you have any question regarding the request or any aspect of the study, you may reach me through my electronic mail address, rachel.remedios@upou.edu.ph or through my mobile phone number, 0923-8287757.

I am praying for your most favorable response. Your participation and contribution to this study are more than highly appreciated. Thank you very much and more power to you!

Sincerely yours,

RACHEL. B REMEDIOS
PhD Physics Education (candidate)
University of the Philippines – Open University

---

*(*Please return this reply form to the researcher after signing. Thank you!)*

REPLY FORM

I, the undersigned, grants the request of the researcher to conduct a review and examination of the Key Informant Interview (KII) guide, FGD guide and the socio-cultural profile sheets for teachers and students for the the study entitled: *"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Leaming Assessment"*.

I further agree to contribute my expertise through my recommendations and suggestions for the enhancement of the above-mentioned research instruments.

Name and Signature of Instruments Reviewer: ______________________

Institution: Ateneo de Davao University______________

Position: ______________________

Date Signed: ______________________

Name and Signature of Researcher: RACHEL B. REMEDIOS

Date Signed: ______________________

APPENDIX F

Informed Parental Consent

This informed parental consent form is given to parents/guardians of selected Grade 12 Science, Technology, Engineering and Mathematics (*STEM*) strand students participating in the research studytitled:

"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment".

This Informed Consent Form is composed of two parts:

- Information Sheet
- Certificate of Consent

Part I: Information Sheet

Researcher and Purpose of Study

A research study is conducted by Rachel B. Remedios from the University of the Philippines – Open University. The purpose of this study is to describe qualitatively the different ways of understanding, beliefs and experiences of Physics learning assessment of selected senior high school physics teachers and learners. This study will contribute to the researcher's completion of herPhD Dissertation. Your child/ward is invited to participate in the said study.

Research Procedures

This study consists of a Focus Group Discussion (FGD) that will be administered to four (4) groups of sixstudent-participants per group, from twoselected senior high schools in Davao City. It will also include semi-structured individual interviews of selected senior high school General Physics 1 teachers. Your child will be asked to participate in an FGD and answer a series of questions related to his/her understanding, beliefs and experiences of Physics Learning Assessment. The actual FGD will be audio-recorded in order to retrieve the data for analysis.Should you decide to give your consentand allow your child to participate in this research study, you will be asked to sign this consent form.

Time Required

A single FGD session with a group of student-participants will require sixty (60) to ninety (90) minutes of your child's time. This will be conducted in your child's/ward/s campus and be scheduled during the vacant time or extended learning time of the class of your child so as not to interfere with his/her academic and non-academic activities. The study will be composed of one FGD per group only for the entire data gathering period this first semester of school year 2017-2018.

Risks

No risks more than the minimal risks or beyond those associated with everyday life are perceived by the researcher from the participation of your child/ward in this study.

Benefits

There may be no direct benefits to your child for participating in this study. However, the ideas and experiences that they will share will be part of a rich source of baseline data that can be used by the teachers, curriculum designers and education policy-makers for the improvement of Physics education in the country.

Payment for participation

The participants will not receive any compensation or payment for taking part in the study. During the FGD, snacks and simple tokens of appreciation and gratitude will be given to your child/ward instead.

Confidentiality

The results of this research will be presented to the dissertation panel of the University of the Philippines – Open University during the final defense of the dissertation. The identity of your child/ward will be completely kept unknown by assigning pseudonym to him/her. The researcher retains the right to use and publish non-identifiable data. When the results of this research are published or discussed in conferences, no information that would reveal your child's identity will be included. Upon completion of the study, all data (including audio recorded files) will not be destroyed but will be highly secured such that only the researcher will have access to it.

Participation & Withdrawal

The nature of your child's/ward's participation in this study is completely voluntary. Should you and your child choose to participate but change your mind later, he/she can withdraw at any time without consequences of any kind.

Questions about the Study

The researcher is open and accessible to you should you have questions or concerns regarding the participation of your child/ward in this study. You may also express your interest of receiving a copy of the final aggregate results of this study, please contact:

Dissertation Advisor's Name: Dr. Vivien Talis on
University of the Philippines – Diliman
Email Address: vtalisayon@gmail.com

*(*Please return this reply form to the researcher through your child/ward during the pilot FGD session. Thank you!)*

Part II. Giving of Consent

Certificate of Consent

I have read this consent form and I understood what is being requested of my child/ward as a participant in this study. I freely consent for my child to participate. I have been provided with satisfactory answers to my questions. The researcherhas provided me with a copy of this form.

(Please tick the box to confirm your consent.)

☐ I give consent for my child to be audio-taped during their focus group discussion.

______________________________ ______________________

Name of Child (Printed) Grade Level and Section

____

Name of Parent/Guardian (Printed)

______________________________ ______________

Signature of Parent/Guardian Date

______________________________ ______________

Name of Researcher (Signed) Date

APPENDIX G

Student's Informed Assent to Participate in Research

This informed assent form is given to Grade 12 Science, Technology, Engineering and Mathematics, *STEM*, strand students who are taking General Physics 1 and participating in the research study entitled:

"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment".

This Informed Consent Form is composed of two parts:

- Information Sheet
- Certificate of Consent

Part I: Information Sheet

Researcher and Purpose of Study

A research study is conducted by Rachel B. Remedios from the University of the Philippines – Open University. The purpose of this study is to describe qualitatively the different ways of understanding, beliefs and experiences of Physics learning assessment of selected senior high school physics teachers and learners. This study will contribute to the researcher's completion of herPhD Dissertation. You are being invited to participate in the said study.

Research Procedures

This study consists of semi-structured individual interviews of selected General Physics 1 teachers from two different senior high schools in Davao City. For the student-participants who will also be coming from the senior high schools of the teacher-informants, Focus Group Discussions (FGD) will be administered to four (4) groups of sixstudent-participants per group. You will be asked to participate in the FGD and answer a series of questions related to your understanding, beliefs and experiences of Physics Learning Assessment. The FGD session will be audio-recorded in order to retrieve the data for analysis. Should you decide to give your consentand decide to participate in this research study, you will be asked to sign this consent form.

Time Required

A single FGD session with a group of student-participants will require sixty (60) to ninety (90) minutes of your time. This will be conducted in your campus and be scheduled during your vacant time or extended learning time so as not to interfere with your academic and non-academic activities. The study will be composed of one FGD per group only for the entire data gathering period this first semester of school year 2017-2018. However, should there be a need to call for a second FGD session, it will be run for an hour only.

Risks

No risks more than the minimal risks or beyond those associated with everyday life are perceived by the researcher from your participation in this study.

Benefits

There may be no direct benefits to you for participating in this study. However, the ideas and experiences that you will share will be part of a rich source of baseline data that can be used by the teachers, curriculum designers and education policy-makers for the improvement of Physics education in the country.

Payment for participation

The participants will not receive any compensation or payment for taking part in the study. During the FGD, meal/snacks and simple token of appreciation and gratitude will be given to you instead.

Confidentiality

The results of this research will be presented to the dissertation panel of the University of the Philippines – Open University during the final defense of the dissertation. Your identity will be completely kept unknown by assigning you pseudonym. The researcher retains the right to use and publish non-identifiable data. When the results of this research are published or discussed in conferences, no information that would reveal your identity will be included. Upon completion of the study, all data (including audio recorded files) will not be destroyed but will be highly secured such that only the researcher will have access to it.

Participation & Withdrawal

The nature of your child's/ward's participation in this study is completely voluntary. Should you choose to participate but change your mind later, you can withdraw at any time without consequences of any kind.

Questions about the Study

The researcher is open and accessible to you should you have questions or concerns regarding your participation in this study. You may also express your interest of receiving a copy of the final aggregate results of this study, please contact:

Researcher's Name: Rachel B. Remedios
Ateneo de Davao University – Senior Hi chool
Email Address: rachel.remedios@upou.

Dissertation Advisor's Name: Dr. Vivien Talisayon
University of the Philippines – Diliman
Email Address: vtalisayon@gmail.com

*(*Please return this reply form to the researcher during the FGD session. Thank you!)*

Part II. Giving of Consent

1. I agree to be a participant in the FGD for the purpose of this study stated above.
2. The purpose and nature of the interview has been explained to me, and I have read the information sheet as provided by the researcher.
3. I agree that the FGD session may be audio and electronically recorded.
4. I understand that my words may be quoted directly. (*With regard to being quoted, please tick the box next to any of the statements that you agree with:*)

☐ I agree to be quoted directly with my real name.
☐ I agree to be quoted directly but my real name is not published and a made-up name (pseudonym) is used.

____

Name of Student-Participant

______________________________ ____________

Signature of Student-ParticipantDate

I have explained the research study and the implications of being interviewed to the interviewee. I believe that the consent is informed and that he/she understands the implications of participation.

Name of interviewer/researcher: ______________________________
Signature of interviewer: ______________________________
Date: ________________

APPENDIX H

Informed Consent For Teachers

This informed consent form is given to teachers in Senior High School General Physics 1 (given to Grade 12 Science, Technology, Engineering and Mathematics, *STEM*, strand students) participating in the research study entitled:

"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment".

This Informed Consent Form is composed of two parts:

- Information Sheet
- Certificate of Consent

Part I: Information Sheet

Researcher and Purpose of Study

A research study is conducted by Rachel B. Remedios from the University of the Philippines – Open University. The purpose of this study is to describe qualitatively the different ways of understanding, beliefs and experiences of Physics learning assessment of selected senior high school physics teachers and learners. This study will contribute to the researcher's completion of herPhD Dissertation. You are being invited to participate in the said study.

Research Procedures

This study consists of semi-structured individual interviews of selected General Physics 1 teachers from two different senior high schools in Davao City. For the student-participants who will also be coming from the senior high schools of the teacher-informants, Focus Group Discussions (FGD) that will be administered to four (4) groups of sixstudent-participants per group. Youwill be asked to participate insemi-structured individual interviews and answer a series of questions related to your understanding, beliefs and experiences of Physics Learning Assessment. The actual interview will be audio-recorded in order to retrieve the data for analysis. Should you decide to give your consentand decide to participate in this research study, you will be asked to sign this consent form.

Time Required

Participation in this study will require at most two (2) hours of your time for a maximum of two separate interview sessions when needed. This will be conducted in your campus and be scheduled only during your vacant and most convenient time so as not to interfere with yourfunctions as a teacher. The data gathering is scheduled to start on the latter part of July 2017 until the end of October 2017.Aside from the interview, you will also be asked to give copies of your assessment tools to the researcher and be observed by the latter in your class during an actual assessment activity (e.g. group work, exam, quiz, etc.) that you will give to your class later.These are needed in order to triangulate the interview results and increase the reliability of the data.You have the freedom to determine what assessment tools to share and the date of the classroom observation.

Risks

No risks more than the minimal risks or beyond those associated with everyday life are perceived by the researcher from your participation in this study.

Benefits

Your participation in this study may not have direct benefits to you. However, your input will take part as source of data about the personal and collective understanding, beliefs and experiences of the senior high school teachers and students in the aspect of physics learning assessment.This can be significant to curriculum designers and professors of teacher education institutes (TEIs) in making pre-service curriculum of future SHS science teachers more responsive to the needs of the time.

Payment for participation

The informants will not receive any compensation or payment for taking part in the study. During the interview, meal/snacks and simple token of appreciation and gratitude will be given to you instead.

Confidentiality

The results of this research will be presented to the dissertation panel of the University of the Philippines – Open University during the final defense of the dissertation. Your identity will be kept completelyunknown by assigning you pseudonym. The researcher retains the right to use and publish non-identifiable data. When the results of this research are published or discussed in conferences, no information that would reveal your identity will be included. Upon completion of the study, all data (including audio recorded files) will not be destroyed but will be highly secured such that only the researcher will have access to it.

Participation & Withdrawal

The nature of your participation in this study is completely voluntary. Should you choose to participate but change your mind later, you can withdraw at any time without consequences of any kind.

Questions about the Study

The researcher is open and accessible to you should you have questions or concerns regarding your participation in this study. You may also express your interest of receiving a copy of the final aggregate results of this study, please contact:

Researcher's Name: Rachel B. Remedios
Ateneo de Davao University – Senior High School
Email Address: rachel.remedios@upou.edu.ph

Dissertation Advisor's Name: Dr. Vivien Talisayon
University of the Philippines – Diliman
Email Address: vtalisayon@gmail.com

---

*(*Please return this reply form to the researcher through your child/ward during the pilot FGD session. Thank you!)*

Part II. Giving of Consent

1.I agree to be interviewed for the purpose of this study stated above.
2.The purpose and nature of the interview has been explained to me, and I have read the information sheet as provided by the researcher.
3.I agree that the interview may be audio and electronically recorded.
4. I understand that my words may be quoted directly. (*With regard to being quoted, please tick the box next to any of the statements that you agree with*:)

☐ I agree to be quoted directly with my real name.
☐ I agree to be quoted directly but my real name is not published and a made-up name (pseudonym) is used.

____

Name of Teacher-Informant

______________________________ ____________

Signature of Teacher-Informant Date

I have explained the research study and the implications of being interviewed to the interviewee. I believe that the consent is informed and that he/she understands the implications of participation.

Name of interviewer/researcher: ______________________________
Signature of interviewer: ______________________________
Date: ____________

APPENDIX I

Informed Consent for Teachers (Pilot-Test)

This informed consent form is given toSenior High School General Physics 1 teacher of Grade 12 Science, Technology, Engineering and Mathematics (*STEM*) strand participating in the *pilot-test of the key-informant interview (KII) protocol* to be used in the research study entitled:

"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment".

This Informed Consent Form is composed of two parts:

- Information Sheet
- Certificate of Consent

Part I: Information Sheet

Researcher and Purpose of Study

A research study is conducted by Rachel B. Remedios from the University of the Philippines – Open University. The purpose of this study is to describe qualitatively the different ways of understanding, beliefs and experiences of Physics learning assessment of selected senior high school physics teachers and learners. This study will contribute to the researcher's completion of herPhD Dissertation. You are invited to participate in the said study.

Research Procedures

This study consists of semi-structured individual interviews of selected General Physics 1 teachers from two different senior high schools in Davao City. For the student-participants who will also be coming from the senior high schools of the teacher-informants, Focus Group Discussions (FGD) that will be administered to four (4) groups of sixstudent-participants per group. You will be asked to participate in the *pilot-run of the Key-Informant Interview (KII) protocol* for the semi-structured individual interview for teachers and answer a series of questions related to your understanding, beliefs and experiences of Physics Learning Assessment. The actual interview will be audio-recorded in order to retrieve the data for analysis. Should you decide to give your consentand decide to participate in this research study, you will be asked to sign this consent form.

Time Required

Participation in this study will require at most two (2) hours of your time for a maximum of two separate interview sessions when needed. This will be conducted in your campus and be scheduled only during your vacant and most convenient time so as not to interfere with your functions as a teacher. The pilot-run of the KII guide is scheduled on the last week of June 2017 until the first week of July 2017.

Risks

No risks more than the minimal risks or beyond those associated with everyday life are perceived by the researcher from your participation in this study.

Benefits

There may be no direct benefits to you for participating in this study. However, the ideas and experiences that you will share will be of great help for the enhancement and improvement of the KII protocol.

Payment for participation

The informants will not receive any compensation or payment for taking part in the study. During the interview, meal/snacks and simple token of appreciation and gratitude will be given to you instead.

Confidentiality

The results of this research will be presented to the dissertation panel of the University of the Philippines – Open University during the final defense of the dissertation. Your identity will be completely kept unknown by assigning you pseudonym. The researcher retains the right to use and publish non-identifiable data. When the results of this research are published or discussed in conferences, no information that would reveal your identity will be included. Upon completion of the study, all data (including audio recorded files) will not be destroyed but will be highly secured such that only the researcher will have access to it.

Participation & Withdrawal

The nature of your participation in this study is completely voluntary. Should you choose to participate but change your mind later, he/she can withdraw at any time without consequences of any kind.

Questions about the Study

The researcher is open and accessible to you should you have questions or concerns regarding your participation in this study. You may also express your interest of receiving a copy of the final aggregate results of this study, please contact:

Researcher's Name: Rachel B. Remedios
Ateneo de Davao University –Senior High School
Email Address: rachel.remedios@upou.edu.ph

Dissertation Advisor's Name: Dr. Vivien Talisayon
University of the Philippines – Diliman
Email Address: vtalisayon@gmail.com

---

*(*Please return this reply form to the researcher during the pilot FGD session. Thank you!)*

Part II. Giving of Consent

I have read this consent form and I understood what is being requested of me as an informant *in the pilot-run of the KII protocol for this study.* I freely consent for my participation. I have been provided with satisfactory answers to my questions. The researcher has provided me with a copy of this form.

(Please tick the box to confirm your consent.)

☐ I give consent for my pilot interview to be audio-taped.

______________________________ ________________

Name and Signature of Teacher Date

______________________________ ________________

Name and Signature of Researcher Date

APPENDIX J

Informed Parental Consent (Pilot-Test)

This informed parental consent form is given to parents/guardians of selected Grade 12 Science, Technology, Engineering and Mathematics (*STEM*) strand students participating in the *pilot-test of the focus group discussion (FGD) protocol* to be used in the research studyentitled:

"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment".

This Informed Consent Form is composed of two parts:

- Information Sheet
- Certificate of Consent

Part I: Information Sheet

Researcher and Purpose of Study

A research study is conducted by Rachel B. Remedios from the University of the Philippines – Open University. The purpose of this study is to describe qualitatively the different ways of understanding, beliefs and experiences of Physics learning assessment of selected senior high school physics teachers and learners. This study will contribute to the researcher's completion of herPhD Dissertation. Your child/ward is invited to participate in the said study.

Research Procedures

This study consists of a Focus Group Discussion (FGD) that will be administered to four (4) groups of sixstudent-participants per group, from two selected Senior High Schoolsin Davao City. It will also include semi-structured individual interviews of selected General Physics 1 teachers from the particiapting senior high schools in Davao City. Your child will be asked *to participate in the pilot-run of the FGD protocol and answer a series of questions related to his/her understanding, beliefs and experiences of Physics Learning Assessment*. The actual FGD will be audio-recorded in order to retrieve the data for analysis. Should you decide to give your consentand allow your child to participate in this research study, you will be asked to sign this consent form.

Time Required

The FGD pilot-run session with a group of student-participants will require sixty (60) to ninety (90) minutes. This will only be done once,conducted in their campus andscheduled during their vacant time or extended learning time so as not to interfere with their academic and non-academic activities.

Risks

No risks more than the minimal risks or beyond those associated with everyday life are perceived by the researcher from the participation of your child/ward in this study.

Benefits

There may be no direct benefits to your child for participating in this study. However, the ideas and experiences that they will share will be of great help to enhance and improve the FGD protocol.

Payment for participation

The participants will not receive any compensation or payment for taking part in the study. During the pilot-run, snacks and simple tokens of appreciation and gratitude will be given to your child/ward instead.

Confidentiality

The results of this research will be presented to the dissertation panel of the University of the Philippines – Open University during the final defense of the dissertation. The identity of your child/ward will be completely kept by assigning pseudonym to him/her. The researcher retains the right to use and publish non-identifiable data. When the results of this research are published or discussed in conferences, no information that would reveal your child's identity will be included. Upon completion of the study, all data (including audio recorded files) will not be destroyed but will be highly secured such that only the researcher will have access to it.

Participation & Withdrawal

The nature of your child's/ward's participation in this study is completely voluntary. Should you and your child choose to participate but change your mind later, he/she can withdraw at any time without consequences of any kind.

Questions about the Study

The researcher is open and accessible to you should you have questions or concerns regarding the participation of your child/ward in this study. You may also express your interest of receiving a copy of the final aggregate results of this study, please contact:

Researcher's Name: Rachel B. Remedios
Ateneo de Davao University –Senior High School
Email Address: ~~rachel.remedios@upou.edu.ph~~

Dissertation Advisor's Name: Dr. Vivien Talisayon
University of the Philippines – Diliman
Email Address: vtalisayon@gmail.com

*(*Please return this reply form to the researcher through your child/ward during the pilot FGD session. Thank you!)*

Part II. Giving of Consent

I have read this consent form and I understood what is being requested of my child/ward as *aparticipant in the pilot-run of the FGD protocol for this study.* I have been provided with satisfactory answers to my questions. The researcher has provided me with a copy of this form.

(Please tick the box to confirm your consent.)

☐ I give consent for thepilot FGD session to be audio- and electronically recorded.

____

Name of Parent/Guardian (Printed)

____________________________________ ______________

Signature of Parent/GuardianDate

____________________________________ ______________

Name of Researcher (Signed) Date

APPENDIX K

Informed Assent to Participate in Research (Pilot-Test)

This informed assent form is given to Grade 12 Science, Technology, Engineering and Mathematics, *STEM*, strand students who are taking General Physics 1 and participating in the *pilot-test of the focus-group discussion (FGD) protocol* in the research study entitled:

"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment".

This Informed Consent Form is composed of two parts:

- Information Sheet
- Certificate of Consent

Part I: Information Sheet

Researcher and Purpose of Study

A research study is conducted by Rachel B. Remedios from the University of the Philippines – Open University. The purpose of this study is to describe qualitatively the different ways of understanding, beliefs and experiences of Physics learning assessment of selected senior high school physics teachers and learners. This study will contribute to the researcher's completion of herPhD Dissertation. You are being invited to participate in the said study.

Research Procedures

This study consists of semi-structured individual interviews of selected General Physics 1 teachers from two different senior high schools in Davao City. For the student-participants who will also be coming from the senior high schools of the teacher-informants, Focus Group Discussions (FGD) will be administered to four (4) groups of sixstudent-participants per group. You will be asked to participate in the *pilot-run of the FGD guide*and answer a series of questions related to your understanding, beliefs and experiences of Physics Learning Assessment. The FGD session will be audio-recorded in order to retrieve the data for analysis. Should you decide to give your consentand decide to participate in this research study, you will be asked to sign this consent form.

Time Required

The FGD pilot-run session with a group of student-participants will require sixty (60) to ninety (90) minutes of your time. This will only be done once and be conducted in your campus and be scheduled during your vacant time or extended learning time so as not to interfere with your academic and non-academic activities.

Risks

No risks more than the minimal risks or beyond those associated with everyday life are perceived by the researcher from your participation in this study.

Benefits

There may be no direct benefits to you for participating in this study. However, the ideas and experiences that they will share will be of great help to enhance and improve the FGD protocol.

Payment for participation

The participants will not receive any compensation or payment for taking part in the study. During the pilot-run, snacks and simple token of appreciation and gratitude will be given to you instead.

Confidentiality

The results of this research will be presented to the dissertation panel of the University of the Philippines – Open University during the final defense of the dissertation. Your identity will be kept completely unknown by assigning you pseudonym. The researcher retains the right to use and publish non-identifiable data. When the results of this research are published or discussed in conferences, no information that would reveal your identity will be included. Upon completion of the study, all data (including audio recorded files) will not be destroyed but will be highly secured such that only the researcher will have access to it.

Participation & Withdrawal

The nature of your participation in this study is completely voluntary. Should you choose to participate but change your mind later, you can withdraw at any time without consequences of any kind.

Questions about the Study

The researcher is open and accessible to you should you have questions or concerns regarding your participation in this study. You may also express your interest of receiving a copy of the final aggregate results of this study, please contact:

Researcher's Name: Rachel B. Remedios
Ateneo de Davao University – Senior High School
Email Address: rachel.remedios@upou.edu.ph

Dissertation Advisor's Name: Dr. Vivien Talisayon
University of the Philippines – Diliman
Email Address: vtalisayon@gmail.com

*(*Please return this reply form to the researcher during the pilot FGD session. Thank you!)*

Part II. Giving of Consent

1. I agree to be a participant in the pilot-run of the FGD guide for the purpose of this study.
2. The purpose and nature of the interview has been explained to me, and I have read the information sheet as provided by the researcher.
3. I agree that the FGD pilot session be audio and electronically recorded.

____

Name of Student-Participant

____ ______________

Signature of Student-Participant Date

I have explained the research study and the implications of being interviewed to the interviewee. I believe that the consent is informed and that he/she understands the implications of his/her participation.

Name of interviewer/researcher: ____
Signature of interviewer: ____
Date: ____________________

APPENDIX L

Approval Sheet from the School Divisions Superintendent

Department of Education, Davao City Division

REPUBLIKA NG PILIPINAS
KAGAWARAN NG EDUKASYON
REHIYON XI
SANGAY NG LUNGSOD NG DABAW
LUNGSOD NG DABAW
TIN: 000-863-958
TEL. NOS. 224-3274/224-0100/227-4726/225-1172
221-0059/222-1672/221-8587/224-0854/225-3600
www.deped-davaocity.ph

July 24, 2017

RACHEL B. REMEDIOS
UP-OU, PhD Student
University of the Philippines Mindanao
Mintal, Davao City

Dear Ms. Remedios:

This has reference to your letter dated July 24, 2017 requesting permission to conduct research study to selected Senior High School teachers and students of Davao City National High School, this Division, as a requirement for the study entitled **"Physics Learning Assessment: Teachers' and Students' Understanding, Beliefs, Experiences and Performance".**

In this connection permission is hereby granted provided the following conditions are met:

1. That prior arrangement and APPROVAL in writing from the school administrator be made;
2. That classes shall not be disrupted;
3. That all expenses shall be borne by the researcher;
4. That explicit parental and student consent be obtained in writing from each participant prior to their participation in the research;
5. That participants must be informed of voluntary participation, that answers to specific questions may be withheld without penalty, and that they may withdraw from the research at any time;
6. That participants should receive a full disclosure of the nature of study, the risks, benefits and alternatives, with an extended opportunity to ask questions;
7. That CONFIDENTIALITY and ANONYMITY of the personally identifiable information will be maintained throughout the research and thereafter; and
8. That this office shall be furnished with the result of this study.

Please be guided accordingly.

Very truly yours,

MARIA INES C. ASUNCION, CESO VI
Schools Division Superintendent

DepEd-Davao City Division
RECORDS SECTION
RECEIVED
JUL 24 2017
By:

APPENDIX M

Approval Sheet from the School Principal

of School X (Public SHS in Davao City, Philippines)

*(*Please enclose this signed form in the self-addressed envelope that is provided and return to the researcher.)*

RE: Permission to Conduct Research Study (***Dissertation***)

APPROVAL FORM

The request of Ms. Rachel B. Remedios (*PhD – Physics Education student of the University of the Philippines – Open University*) to conduct her dissertation study entitled: ***"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment"*** in our school, Davao City National High School (Senior High School), **is hereby approved and granted.**

The institution requires that the researcher establishes constant coordination with the concerned administrators and teachers for a smooth and non-disruptive data collection process. Results of the study must also be taken cared of with utmost confidentiality.

APPENDIX N

Approval Sheet from the School Director

of School Y (Private-Sectarian SHS in Davao City, Philippines)

*(*Please enclose this signed form in the self-addressed envelope that is provided and return to the researcher.)*

RE: Permission to Conduct Research Study (*Dissertation*)

APPROVAL FORM

The request of Ms. Rachel B. Remedios (*PhD – Physics Education student of the University of the Philippines – Open University*) to conduct her dissertation study entitled: ***"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment"*** (i.e. *pilot-testing of interview and FGD protocols and data gathering*) in our school, Ateneo de Davao – Senior High School, is hereby **approved and granted.**

The institution requires that the researcher establishes constant coordination with the concerned administrators and teachers for a smooth and non-disruptive data collection process. Results of the study must also be taken cared of with utmost confidentiality.

Approved by:

EZ

Name and Position

JUN 2 2 2017

Date

APPENDIX O

SEMI-STRUCTURED INTERVIEW FOR TEACHERS
ATTENDANCE SHEET

Research Title: *"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment"*

Date: ______________

Time: ______________

School: ___________________________

	Name	Signature
1.	____________________	____________________
2.	____________________	____________________

APPENDIX P

FOCUS GROUP DISCUSSION (FGD) FOR STUDENTS ATTENDANCE SHEET

Research Title: *"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment"*

Date: ______________

Time: ______________

School: ___________________________

Name	Signature
1. ______________________	______________________
2. ______________________	______________________
3. ______________________	______________________
4. ______________________	______________________
5. ______________________	______________________
6. ______________________	______________________
7. ______________________	______________________
8. ______________________	______________________
9. ______________________	______________________

APPENDIX Q

CLASSROOM OBSERVATION DURING A

PHYSICS LEARNING ASSESSMENT (Note Sheet)

Research Title: *"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment"*

FGD Group: Grade 12 - ____________________

School :____

Date and Time: __________________________________

Subject: General Physics 1 ________

Type(s) of Physics Learning Assessment Given to Class During Observation:

____

____

____

Observed by: RACHEL B. REMEDIOS *(researcher)*

Teacher Observed (name and signature): ______________________________

Observation and Inferences Notes

____

____

____

____

____

____

APPENDIX R

Letter of Permission to Experts

For the External Check Stage of the Phenomenographic Analysis

(Date)

____
____
____

Re: Request for an Expert Opinion for the External Check of the Categories of Description
and Outcome Space

Dear Sir:

Greetings of peace to you!

I, the undersigned, is currently doing my dissertation for the program Doctor of Philosophy in Physics Education at the University of the Philippines – Open University. My study is entitled: *"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment (PLA)"*. My dissertation advisor is Dr. Vivien Talisayon from UP – Diliman. The study is qualitative and exploratory, hence, data are gathered through semi-structured interviews for the Senior High School teacher-informants and focus group discussion (FGD) for the student-participants. Moreover, the phenomenographic paradigm for data analysis is adopted.

In view of the above, I am writing to express my request for your expert opinion for the 'interjudge communicability' (Cope, 2004) or 'interjudge reliability'of the analysis in my study. Upon your approval, I will be sending a copy of my Chapter 4 (results and discussion) which contains the formulated teachers' and students' categories of description of PLA and the outcome space using the phenomenographic analysis. I would like to ask for your comments and recommendations particularly on the said two output of my analysis.

Should you grant your approval to this request, kindly fill out the attached reply form. You may write your comments directly on the provided hard copy of my paper's Chapter 4 (Results and Discussion) and I will retreive it at your most convenient time.

Your valuable contribution will be cited and acknowledged in the final paper at the completion of this study. There is no payment for the said contribution, however, a simple token of gratitude and appreciation will be given.

Should you have any question regarding the request or any aspect of the study, you may reach me through my electronic mail address, rachel.remedios@upou.edu.ph or through my mobile phone number, 0923-8287757.

I am praying for your most favorable response. Your participation and contribution to this study are more than highly appreciated. Thank you very much and more power to you.

Sincerely yours,

RACHEL. B REMEDIOS
PhD Physics Education (candidate)
University of the Philippines – Open University

(*Please return this reply form to the researcher after signing. Thank you!)*

REPLY FORM

I, the undersigned, grants the request of the researcher to conduct a review and examination the teachers' adns students' categories of description of PLA and outcome space for the the study entitled: *"Teachers' and Students' Understanding, Beliefs and Experiences of Physics Learning Assessment"*.

I further agree to contribute my expertise through my recommendations and suggestions for the study's reliability and over-all rigour.

Name and Signature of Expert: ______________________

Institution: Ateneo de Davao University

Position: ______________________

Date Signed: ______________________

Name and Signature of Researcher:

RACHEL B. REMEDIOS

Date Signed: ______________________