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Using Gooru Learning Management System in A Flipped Classroom: It's Effects on Students' Physics Achievement and Learning Experiences

Salvador John M. Magalong

Philippine Normal University

Philippine Normal University
The National Center for Teacher Education
Taft Avenue Manila

USING GOORU LEARNING MANAGEMENT SYSTEM IN A FLIPPED CLASSROOM: ITS EFFECTS ON STUDENTS' PHYSICS ACHIEVEMENT AND LEARNING EXPERIENCES

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SALVADOR JOHN MOLEJON MAGALONG

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NAME	:	**SALVADOR JOHN M. MAGALONG**
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ABSTRACT

Due to a dearth on research studies on the usage of Learning Management System (LMS) in a flipped classroom (FC) in the Philippines, especially on its effectiveness on students' achievement and learning experiences, this research fills in the need for one. Using an LMS in an FC on learning concepts and developing self-regulated skills are prominently influenced by the principles of constructivism and connectivism. This research study aims to develop a learning module infused with the use of the Gooru Learning Management System (GLMS) in a Flipped Classroom (FC). Specifically, this study sought to determine: (1) if the performance of the group had improved after using GLMS in an FC; (2) if there is a significant difference between the pretest and posttest scores on students' Physics achievement, and; (3) students' learning experiences in terms of physics achievement, independent study skills, and attitudes on the use of technology. The study involved one-hundred two (102) research participants from three (3) intact classes which were considered as one group. The group was given the same treatment following two (2) parts: First part includes out-of-class activities

which are student-centered and uses online lecture method by means of the GLMS. Second part includes in-class activities which are teacher-centered where synthesizing of concepts learned are conducted. After a set of GLMS activities for each focus topic, the students were instructed to answer series of questions probing the learning experiences they have encountered when using GLMS in an FC model.

Overall, a posttest mean score of 12.382 implied that there is an improvement in their performance which can be attributed to the method employed in this study. A t-test for paired samples obtained a p-value of .000 which is less than 0.05 alpha level of significance, and the computed t-value 11.796, which is greater than the tabular t-value of 1.984. This result suggested that the utilization of GLMS in an FC is claimed to be a potential method in increasing students' achievement in Physics in terms of understanding the descriptors of motion in one and two dimensions.

The reflective journal regarding their perception on how the use of GLMS assisted them in Physics, presented that 95.10% of the participants have positive perception that using it is very helpful in understanding the topic. On the area of independent study skills, 46.08% responded that the use of GLMS helped them to become independent learners, as it provides a good learning environment outside the classroom which in turn encourages them to think on their own more and do things independently. Lastly, with regard to the students' attitudes on the use of technology, 76.47% of the research respondents perceived the usefulness of GLMS, hence increasing the degree of positivity toward usage, which in turn subsequently affected the behavioral intention to use it. It is recommended that further studies must be conducted in the development of learning plans using any LMS in a flipped classroom in other areas of Physics or other field of sciences. Moreover, longitudinal studies could be done for further confirmation if the use of GLMS in an FC indeed promotes change in conceptual understanding and perceptions on the use of technology.

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One morning, when I was on the verge of giving up in my thesis writing, I have thought of typing in the search box my name and birthdate:

> *"And He who sent me is with me — He has not deserted me — for I always do those things that are pleasing to Him."* (John 8:29)

The verse made me feel calm and grateful knowing that God has never left me since the day I was born and will stay forever by my side. It serves as a fuel to keep the trust and hope to still continue in my journey no matter what life may bring. I owe my gratitude to our almighty God for designing my life beautifully. I am very thankful to every detail He has planned to fulfill what I am destined to be. God designed me to meet superb people who touched my heart and served a huge purpose in my life. Success in my graduate school would not have been possible without the help of these splendid people and I thank God every day for all of them.

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TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

THE PROBLEM AND ITS BACKGROUND

Background of the Study

To keep abreast with the increasing demands of 21st century education, science teachers constantly seek methods on how to effectively teach students various concepts by employing the use of challenging activities, coupled with enjoyable and creative strategies without compromising the goals that should be met at the end of each lesson (Duman et. al, 2014). Currently, integrating technology in classroom pedagogies and educational materials has been the common trend among educators (Sahrir et al., 2016). Moreover, several researchers have shown that teachers have positive attitudes and feedback regarding the use of on-line resources, and are inclined to discover further dynamics on how to integrate such in classroom instructions.

Along with the technological developments, increasing globalization, scientific innovations, economic pressures, dynamic labor demands, and fast changes in competition today, the abilities needed in the students to contribute to the society and increase their readiness for society have been redefined (Levy & Murnane, 2005; McAuley et al., 2010; and Wilmarth, 2010). In the present information society, the people are expected to regulate within the dynamic advanced society, by selecting information within the information mass, in utilizing this information, to unravel issues of daily life experiences and reworking this information into helpful and purposeful product. Thus, individual ought to possess high-level skills like analytical thinking, inter-personal skills and organization of information (Velez, 2012). The essentials of people in the 21st century to work, for citizenship and to understand oneself are quite completely different from their possessions in the 20^{th} century. The 21^{st} century skills are based on the use of advanced information and communication technologies (Clark & Dede, 2009; and Shute & Becker, 2010). 21^{st} century leaners must be preparing to achieve the world market, by turning into independent, vital thinkers with excellent communication skills according to Fessler (cited in McFarlane, 2013). Hence, the 21^{st} century learners and educators are currently facing the advancement of latest and immense ideas in the use of technology, which conjointly offers challenges within the teaching and learning method.

Information and Communication Technology (ICT) literacy, as outlined by Program for International Student Assessment (cited in Aypay, 2010), is “the interest, attitude and skill of people to fitly use digital technology and communication tools to access, manage, integrate and appraise data, construct new information, and communicate with others to participate effectively in the society.” (p. 116). Moreover, the report also mentioned that 21^{st} century learners are expected to be highly proficient and skilled in terms of ICT to achieve the current demands of the academic system. Correspondingly, varied teaching methods have been developed by taking the benefits of computer tools and web to deal with the pressing needs of the learners (Ndeya-Ndereya & Tshabalala, 2015). Moreover, ICT advancements have expedited the integration between the standard face-to-face and computer hybrid learning environments known as blended learning. Various research studies have conferred several definitions of blended learning (BL).

Consistent with Shibley (2009), BL involves employing a combination of face-to-face exchanges and on-line interactions within the same course. Students still frequently meet in the classroom in a blended course; however, the frequency of these conferences is typically reduced. The goal of BL is to facilitate larger student learning and will therefore match within a learner-centered paradigm. Additionally, BL as represented by Thorne (cited in Kashefi et al., 2012) is the combination of standard and interactive-rich varieties of classroom teaching with any of the innovative technologies like multimedia system, video streaming, CD-ROM, email/conference calls, virtual classroom, and on-line animation/video streaming technology. Also, Finn and Bucceri (cited in Akkoyunlu & Soylu, 2006) described the BL setting as a distinct variety of distance education that combines the benefits of distance education with the effective aspects of traditional education, like face-to-face interaction.

Among the model of instructions utilized within the BL approach is Flipped Learning (FL). Consistent with Arfstrom and Network (2013), FL is an instructional model in which digital technologies are used to shift direct instruction outside of the cluster learning area to the individual learning area. Moreover, offloading direct instruction in this means permits lecturers to rethink how to maximize individual face-to face time with students. Time becomes available for students to collaborate with peers on projects, interact more deeply with content, apply skills, and receive feedback on their progress. Teachers will devote longer to coaching their students, serving to them develop procedural fluency if needed, and inspiring and aiding them with challenging projects that provide them larger control over their own learning.

Teachers record and narrate screencasts of work they are doing on their computer desktops, produce videos of themselves teaching, or rector video lessons from internet sites such as TED-Ed and Khan Academy. However, in spite of the apparent ease and interest on tools used in FL, the employment of videos or different digital technologies to deliver content outside category of sophistication does not guarantee that anything different will occur throughout class time. However, because of the emphasis on students turning into the agents of their own learning instead of the object of instruction, the FL model will enable educators to form the shift from teacher-driven instruction to student-centered learning. Hence, an efficient academic platform through a learning management system (LMS) should be used to effectively monitor and deliver personal directions at one's own pace.

According to Sahrir et al. (2016), an LMS is an integrated, comprehensive software that reinforces the delivery, development, administration and assessment of courses in conventional face-to-face, online or blended learning environments. The LMS is also found to sustain blended learning environment as reported by Ssekakubo, Suleman and Marsden (cited in Sahrir et al., 2016). In the year 2009, Lonn claimed that LMSs can assimilate functionality that supports interaction between and among students and instructors (West, Waddoups, & Graham, 2007) to deliver opportunities for allowing institutional coinage in learning and education (Dutton, Cheong, & Park, 2003). Furthermore, LMSs are providing tools for the types of active on-line engagement embraced by today's generation of students (e.g., discussion tools, chat rooms, wikis, and blogs). The tools within LMS deliver circumstances for utilizing these systems coherent with constructivist approaches that stimulate students to construct their own understandings of the world, instead of the direct transmission of knowledge models of learning that most of the time fail to involve and motivate the learners (Papastergiou, 2006). More people are researching how the embedded ideas of user-generated content, network effects of mass participation, openness and low barriers to entry can be applied to traditional education axioms like student engagement, interaction in learning, and student ownership and management of learning (Mason & Rennie, cited in Knight et al., 2010). There are several new platforms of LMS that are widely employed in the teaching and learning discourse. To name a few are Google Classroom, Schoology, Nearpod and one of the promising LMS platforms is Gooru. It is free customized learning solution that helps teachers to search out, remix, and share collections of web resources on any K-12 topics which are not all present in other LMSs. In addition, Google Classroom does not have a real-time summary analytics of the students' individual outputs on the teacher's dashboard, but only shows the summary of the class' responses on a page. Schoology, on the other hand, performs basic functionalities like summarizing students' responses, allowing window time to answer assessments and providing real-time feedback to students. Its functionalities are not being used fully since it is a paid application. Lastly, Nearpod, a paid application, only performs limited tasks since it allows 25 students to access it at a time, thus individualized learning is compromised. In this study, Gooru was chosen as the focus since its interface can display both summary analytics of all responses and students' individual responses on the same page. It is also free web application which offers almost the same tasks as compared to Schoology, Google Classroom and Nearpod.

In spite of the fact that LMS are increasingly essential applications for teaching and learning process (Salaway, Caruso, & Nelson cited in Lonn & Teasley, 2009), very little information is known about how these systems stimulate student learning (Koszalka & Ganesan cited in Lonn, 2009). Related analysis studies showed that students effectively used LMS as a platform to collaborate and construct information to accomplish course-related group projects as described by Lonn, and Psycharis (cited in Cavus & Zabadi, 2014). Furthermore, virtual learning environment (VLE) indicated correlation to the students' achievement in their course (Chowdhry et al., 2014). This new pedagogy, in the case of science teaching and learning, employs: high-order thinking and learning skills, a constructivist approach to science teaching and learning, and scientific literacy skills using digital means and advanced technologies as said by Psycharis et al., (cited in Cavus & Zabadi, 2014). Also, teaching in an e-learning environment will contribute to the ability to teach, the ability to learn and most significantly to bridge the two main parts within the classroom ─ the teacher and the learner. In addition, Sengel (2014) found out that students engaged in the flipped classroom are found to match the performance or better on physics achievement test. On the other hand, students who initially struggled with the new format adapted the flipped classroom quickly and found the format to be effective.

Moreover, to determine how to best engage the students, it is important to study and understand the students' learning experiences in a blended course in an FC (Muehl, 2015). Hence, e-learning environments ought to be carefully designed to completely address different learning styles, prior knowledge and self-regulation skills. Self-regulating Learning (SRL) is a construct that includes several aspects of educational learning and provides a lot of general views of the skills, knowledge and motivation that students acquire (Paris & Paris, 2001). SRL includes intellectual learning strategies for effective study and motivational tendencies for students to learn (Cleary & Platten, cited in Anand et al., 2015). As studied by Zimmerman (cited in Nguyen & Ikeda, 2015), SRL is a self-directive process in which students transform their cognitive abilities to academic skills, and learning is a driven process in which students actively participate with major accountability and enthusiasm.

Through journal writing, students' learning experiences are best described and demonstrated by pieces of evidence of metacognitive awareness (Rasekh & Ranjbary, 2003). In

Macdonald's study (cited in Guo, 2014), reflective journals make students aware of, and control learning by means of what they should grasp, assessing what they recognize, and the way they link that gap throughout learning conditions. The learner diaries involve manifestations of students' efforts in making sense of events, and serve as a window into their conceptual and emotional engagement with the teaching they underwent (Kawalkar & Vijapurkar, 2015). In addition, Park (2009) suggests that an online learning occurs through an LMS that offers flexible and accessible learning applications. There are standardized applications, but they are not always versatile to the educator's teaching and learning objectives. It has been acknowledged that such platforms have been effectively used to enable reflective learning processes of individuals and collaborative learning (Griffith & Liyanage, 2008), Herrington & Oliver (cited in Park, 2009). From the students' perspective of participation in online learning, reflective learning through an LMS is vital in considering how to strengthen both students' expression for their individual engagement and connection for collaborative involvement without requiring face-to-face interaction (Park & Son, 2011).

The focus of this study is to determine the effectiveness of Gooru Learning Management System (GLMS) in a Flipped Classroom (FC) on the students' achievement in Physics and learning experiences on the use of technology. This study was opted to be explored by the researcher considering the subsequent reasons: (1) *there is a dearth on research studies on the usage of Learning Management System in a flipped classroom*; (2) *there is a limited number of studies that has been conducted concerning Gooru Learning Management System used in Physics topics and its effects on students' achievement and learning experiences*; lastly (3) *the present study hopes to provide practical quantitative and qualitative evaluation methods* *which can be utilized to properly address the needs and demands of the 21st century learners*. This research endeavor aims to develop a learning module infused with the use of the GLMS in an FC. It will further probe and assess its effects on students' learning experiences in terms of independent study skills and attitudes toward the use of technology, together with their performance in Physics.

Conceptual Framework

This study aims to determine the effectiveness of Gooru Learning Management System (GLMS) in a Flipped Classroom (FC) on the students' achievement in Physics and learning experiences on the use of technology. Using an LMS in an FC on learning Physics concepts and developing self-regulated skills are prominently influenced by the principles of constructivism and connectivism. According to Piaget (cited in Duffy & Jonassen, 2015), constructivism is a conception of knowledge and learning that starts from the concept that knowledge is recognized by the interaction of the individual with the social and physical setting, by its action and not by any previous endowment, nor the knowledge that the student receives in the classroom by the teacher. Clearly, constructivism supports the idea that students in a flipped classroom model will be actively responsible for his own learning, as he views knowledge as being formed through experience provided by the GLMS features and functionalities. On the other hand, connectivism, a new proposed theory by Siemens (2005) and Downes (2010), concerns learning by means of connecting specialized nodes or data sources with the aid of nonhuman appliances (Altuna & Lareki, 2015). This learning theory is closely associated with digital technologies which suggests a new way of learning through networks or nodes. Hence, being constantly linked to new technologies and webworks may enable universal learning (Yodsaneha & Sopeerak cited by Altuna and Lareki, 2015). This theory is supported by Pegrum (2009) (cited in Senior, 2010) who observes that in the world of technology, knowledge is a property of the network rather than an individual control.

In an FC environment, students ought to accomplish a full-length lesson on a subject following the series of activities and assessments designed by the teacher. According to Bergman and Sams (cited in Overmyer, 2007) this model encompasses any use of using web technology to leverage the learning in a classroom so that an educator will spend longer interacting with students rather than lecturing. Moreover, what used to be classwork (the lecture) is completed at home via teacher-created videos and what used to be school assignment (assigned problems) is now done in class. FCs are active in terms of individualized directions, information delivery outside the room, and lesson content available anytime. Consequently, teachers become facilitators toward student understanding, instead of dispensers of specifics, while students become active learners rather than passive receivers of information (Mehta et al., 2013). According to Thoms (2013), the difference is where instruction and activities occur. Instruction in the blended learning curriculum is teacher based while a detailed and concise teacher-based instruction in the flipped classroom approach is done online. Furthermore, she found out that there is a pedagogical connection between blended learning curriculum and flipped classroom based on the following students' feedback: *(1) the teacher's presence; (2) feelings that there was reduced stress; (3) peer-to-peer support and interaction; and (4) better use of time.*

In the ever-dynamic profile of BL environments, a requirement for the instructional practicality of LMSs is essential which can give an educational platform to effectively deliver instructions to the students as suggested by Doering (2006). Using an LMS as a platform is an unfamiliar methodology of lesson development and assessment activities among the Filipino high school students. Research studies have evidenced the positive effects of using LMSs in terms of the improvement of students’ achievement and attitudes on the employment of technology (Papazoglou et al., 2005; Tsiakas et al., 2005; Vassilakis et al., 2006; Emelyanova & Voronina, 2014; Rovai & Jordan, 2004; Preston et al., 2010; and Kabassi et al., 2016).

Moreover, Papastergiou (cited in Lonn, 2009) reiterated that direct transmission of knowledge models of learning often fails to engage and motivate learners compared with the LMS that provides opportunities for using these systems according to constructivist approaches and more importantly, it encourages students to build their own understandings of the world. In addition, LMS may help ignite a shift from "the transmission of information towards the management and facilitation of student learning" Coaldrake & Stedman (cited in Lonn, 2009). Furthermore, social and collaborative learning enables students to construct a deeper understanding of material and lead to outcomes not possible in a strictly top-down learning environment. (Papert, 1980; Vygotsky and Rogoff (cited in Knight, 2010).

In a study conducted by Derntl and Mazzurana (2010), he used and investigated blogs and their effects as they were integrated into a Learning Management System and were utilized as a method for reflecting on assignments, issues, ideas, and other things of relevance, as well as a tool for virtual community building. He found out that blogging activities seemed to be a good indicator of student performance, which could help teachers and facilitators in identifying "blog lazy" students as potential drop-outs and/or low performers. Furthermore, blogs provide an unexpectedly abundant source of insight into students' learning processes, sharing of personal successes and significant events encountered during the course, including hints about difficult stages in problem-solving processes, information about issues with teamwork, deadlines, and assignment descriptions, as well as valuable feedback on the course in general.

Kahn et al. (cited in Afzalur et al., 2002) noted the following benefits of reflective practice for academic improvement: (i) expansion of personal qualities (e.g. enlarged self-confidence); (ii) improved ability for reflective processes; (iii) improved capacity for practice; (iv) change of practice and (v) establishment of helpful relationships among individuals involved in the reflective processes.

As stated by Meyer et al. (cited by Field et al., 2014), the most common predictor of independent learning is "self-regulated learning". Moreover, Zimmerman (cited in Paris & Paris, 2001) defined self-regulation as the self-generated feelings, actions, and thoughts that are planned and seasonally modified to the attainment of personal goals.

Furthermore, he claims that when students are able to self-regulate their learning, they are motivated to take responsibility for their learning; are able to work with others to enhance the depth and breadth of their learning; and have an understanding of their own approach to learning and how best to maximize their learning in the most efficient ways.

A way of developing a method for independent learning is by evaluating classroom approaches through journals (Field et al., 2014). Moreover, independent study skills will be developed by helping students to develop their self-regulated learning skills which would make them more independent learners.

According to Taylor et al. (cited in Anand, 2015), self-regulated learning, widely believed to be essential to independent study, has been shown to contribute to overall performance of students, as well on lower attrition rates. Thus, Zimmerman (cited in Nguyen & Ikeda, 2015) suggested that self-regulated learners ought to have the following skills: setting goals, planning methods, monitoring performance, changing the context, managing time, evaluating strategies, attributing exploit results, and adapting future strategies. Hence, one of the indicators of a successful independent learning is by self-monitoring through journal reflections.

In support with the idea of constructivism and connectivism, Anand (2015) argues that in order for the students to work effectively individually and collaboratively, they often need assistance to develop independent study skills that will equip them particularly outside formal class time. He concluded in his study that it will be helpful once students are delivered individually relevant learning support via mobile learning.

On students' attitudes toward the use of technology, Lukow (2002)) presented in his paper that students are of the judgment that the utilization of technologies in higher education can beneficially rebuild learning; however, technologies will never replace lecturers. Results of the study of Pardamean et al. (2013), concluded that performance in graphing theory of the experimental group using the LMS was significantly better than the conventional group. In addition, results showed that Technology Acceptance Model (TAM) domains, a tool to analyze and understand factors that influence the acceptance of the use of computer technology, had a positive correlation with the use of LMS. Also, and there have been evidences that the use of LMSs leads to the improvement on the following: engagement, stimulation, motivation, attitudes, interest, responsibility, focus of task, enjoyment, persistence, confidence, commitment, and behavior as reflected in the results of the studies of Martín and Fernández; and Mahnegar (cited in Cavus & Zabadi, 2014).

In 2011, Prasad Ram, introduced Gooru as a non-profit education technology start-up with an undertaking to honor the right to education. It is a learning navigator system that empowers students with actionable online interface so that they will learn through a method that suits them very well. In addition, Gooru LMS will enable students to experience worldwide community for it brings the ability to access and navigate huge information and crowd-sourced educators' contribution.

In Gooru, teachers can support each type of learner to assist students reach their full potential. The following are the Gooru's special features which can support teachers in springing up with interactive Physics on-line activities:

- *Find.* This feature allows teachers to find, choose and filter thousands of U.S. standards-aligned multimedia learning materials on any K-12 topics. In this study, physics ideas involved are aligned with the Department of Education K to 12 Basic Education Curriculum for Science. The researcher carefully aligns all available multimedia learning materials tailored for Filipino students. Varied on-line activities and multimedia system learning materials are available for the chosen physics learning competencies on kinematics, for example: On-line resources, such as formative assessments, videos, and articles are organized in a list.

- *Playlist.* Gooru organizes all on-line learning contents through a Playlist, just like the one we have in our tablets and phones. This allows teachers to design how lessons will be developed and when will assessments be given. Teachers can either remix and then reorder original and existing collections to create custom collections or start from scratch. It also allows users to make original multiple choices, true or false, fill in the blank, or open-ended questions. In this study, Playlists are customized to introduce ideas wherein students are prompted with queries or formative assessments to assist them in creating a scaffold of ideas and concepts toward understanding. At the end of each playlist, students write their reflections and learning experiences using a structured reflective journal.

- *Share.* Collections within the playlist are shared for the students to study in school or on their own, as homework. It permits students to use personal learning at his own time and can repeatedly go through the learning process via a Playlist. If a student finds a particular physics topics confusing, he can freely go over the previous steps for him to be able to review the scaffolding method. Also, to encourage team teaching, colleagues and partner teachers can be added as collaborators on the collections and contribute to an open community of lecturers worldwide.

- *Monitor.* This allows teachers to monitor each student's engagement, comprehension, and progress as this LMS feature gives a real-time update on how the students are doing. It connects a community of educators and learners. It supports many alternative instructional uses and types of learners to enhance all students' learning outcomes. Its on-line quiz setting offers students instant feedback on their progress and provides teachers with assessment results and learning resource suggestions. This feature intervenes in real-time and pinpoints exactly where the students encounter difficulty, as well as what they precisely accomplish with ease. Also, this enables teachers to examine how much time each student spends working on a collection, and monitor students' responses to the questions and view their reactions to specific resources.

This study will target the effectiveness on the use of GLMS among the Grade 10 students of De La Salle Santiago Zobel School . To date, there has been no research conducted on the effectiveness of GLMS in an FC on the students' achievement in Physics and learning experiences on the use of technology.

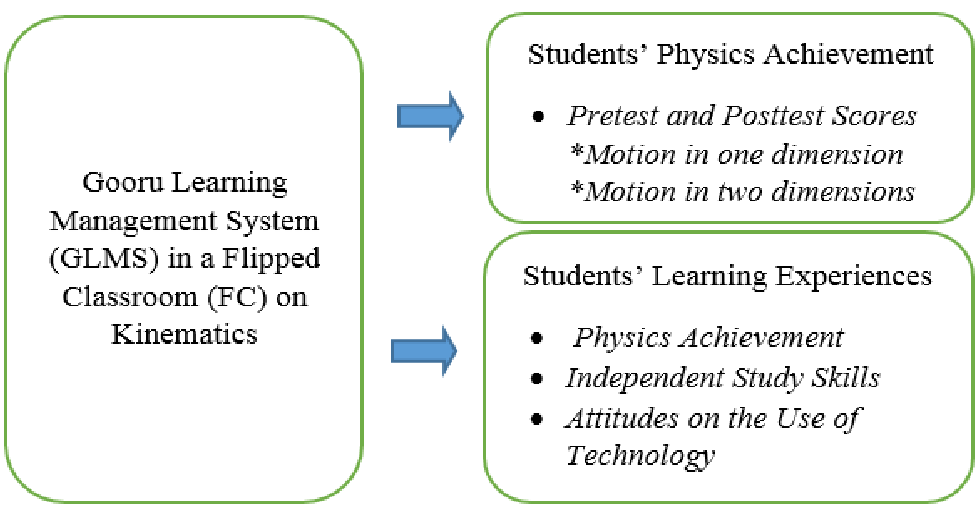


Figure 1. Conceptual Framework of the Study

Figure 1 represents the conceptual framework of the study. Literature and studies noted that the utilization of LMS could influence the students' achievement and learning experiences on the use of it. The conceptual framework is inspired on the learning theories of constructivism and connectivism which support the idea that a student is responsible to construct his own learnings through meaningful experiences with the aid of nonhuman appliances. These learning theories are closely associated with digital technologies which suggest a new way of learning through networks or nodes. The independent variable is the utilization of GLMS as an online platform in a flipped classroom on Kinematics concepts particularly on uniformly accelerated motion. This study aims to determine the effectiveness of employing GLMS to students' achievement in Physics using a teacher-made test in terms of the pretest and posttest scores. Moreover, students' achievement will be further analyzed specifically on learning competencies in understanding motion descriptors in one and two dimensions. It includes students' understanding on horizontal, vertical and projectile motions, and enhancing problem solving skills involving bodies that are uniformly accelerating. Furthermore, this study aims to determine the effect of using LMS on the students' learning experiences in terms of physics achievement, independent study skills and attitudes on the use of technology through reflective journals.

Statement of the Problem

This study aims to determine the effectiveness of using Gooru Learning Management System in a flipped classroom on the students' Physics achievement and learning experiences. Specifically, the study intends to answer the following questions:

1. What is the students' Physics achievement before and after the use of Gooru Learning Management System in a flipped classroom?
2. Is there a significant difference between the pretest and posttest mean scores on students' Physics achievement?
3. What are the learning experiences of the students in terms of:

    a. physics achievement;

    b. independent study skills; and

    c. attitudes on the use of technology.

Statement of Hypothesis

Research question no. 1 sought to determine if the students have the same entry knowledge about the concepts of motion, and after the use of GLMS in a flipped classroom. Research question no. 2 sought to determine if the use of GLMS in an FC made a significant difference on the performance of the students. Lastly, research question no. 3 sought to determine the students' learning experiences on the use of GLMS in terms of physics achievement, independent study skills and attitudes on the use of technology. Hence, the alternative hypothesis is formulated for research question no. 2:

There is a significant difference between the pre-test and post-test mean scores on students' Physics achievement.

Significance of the Study

The study aims to evaluate the effectiveness of using Gooru as an LMS in a flipped classroom and to determine students' learning experiences on the use of technology. The researcher believes that this study will be beneficial to the following:

Students. Students, or the digital natives (Prensky, 2001), may gain positive attitude towards the use of technology and self-regulated skills by using an LMS as a platform. It is also believed that the GLSM will facilitate students through a range of vital learning processes that they will encounter by navigating within the GLMS functionality tools. Furthermore, this LMS will allow students to relate with different subject areas further, as to develop important personal and creative skills. It is also expected to make learning experience more gratifying and valuable to the students. Consequently, it will enhance students' interest in and appreciation of the utility of mobile learning devices and LMSs in education.

Science teachers. Results on the effectiveness of using GLMS in an FC might enrich teaching styles on a technology-based platform lessons. It will encourage updating teachers with latest educational materials to be updated with the advances in technology. Findings from this research may potentially draw additional learning techniques and determine the effectiveness of utilizing LMSs in teaching concepts to the students and in several fields of science. It will provide quantitative measures on how to understand the learning styles and skills of the digital learners as evidenced in their journal reflections.

Administrators. Results may provide information on the appropriateness of the usage of LMSs in the teaching-learning process. Gathered evidences of its effectiveness may serve as a support to adapt FC model in the coming years and will provide empirical data in presenting to the parents the advantages of this approach.

Researchers. Findings of this study may serve as an initial basis of studies of comparable nature and would encourage different researchers to figure on the development and validation of learning plans using LMS in teaching concepts under their respective areas of discipline. Researchers may also conduct further studies on the use of various platforms apart from the GLMS and its effects on the other domains of self-regulating learning.

Scope and Delimitation

This study is mainly focused on gathering empirical measurements on the effects of utilizing Gooru Learning Management System in a flipped classroom on the students' achievement in Physics and learning experiences.

In an FC model, an LMS was used as means for the researcher to facilitate in creating, delivering and conducting learning contents, while simultaneously monitoring learner's participation and assessing the performance through mobile learning device and/or personal computer. However, only limited features such as: class monitoring, collection playlists and assessments, of the Gooru Learning Management System were used in this study since the US-based Gooru Company had an update of the system at the start of their summer break, which was also the start of classes here in the Philippines. Hence, the use of Google Forms was maximized to suffice the beta features of Gooru as consulted and approved by the researcher's adviser.

The scope of the learning plans and the teacher-made achievement test covers the topics on motion concepts aligned to the competencies from the Department of Education K-12's Basic Education Science Curriculum. Learning competencies include understanding of the descriptors of motion in one and two dimensions, and enhancing problem solving skills involving bodies that are uniformly accelerating. Hence, the following topics are the scope of the study: (1) Uniformly Accelerated Motion – Horizontal Motion, (2) Uniformly Accelerated Motion – Vertical Motion, (3) Projectile Motion. In addition, prepared online activities and assessments were carefully aligned on the expected goals by the students of De La Salle Santiago Zobel School in relation to its ICT Vision and Mission program. The initial drafts of the developed learning plans, teacher-made achievement test and reflective journal template were checked and validated by nine (9) Science experts, particularly in the field of Physics education, flipped based instructions and counseling, using an adapted and modified checklist questionnaire of Hadley (cited in Pantig, 2013).

A total of 102 research participants were considered in this study from the Grade 10 students of De La Salle Santiago Zobel School during the first trimestral term of the school year 2016-2017. The student participants are handled by the researcher and composed of students that are considered heterogeneous in terms of intellectual abilities. Purposive sampling was utilized in selecting the groups of the student participants for convenience in time and easy accessibility of information. In addition, the class schedule of the researcher did not match with the class schedules of the other classes handled by the two (2) Physics teachers in the research locale; thus, simultaneous monitoring of progress and implementation will not be possible if the said classes will be involved in this study.

The data collected in the gain scores or difference in the achievement test would be the reference in determining the effectiveness of the use of the GLMS. Pretest and posttest scores were compared to determine if the use of an LMS significantly affects the students' Physics achievement. On the other hand, learning experiences were described in terms of physics achievement, independent study skills and attitudes on the use of technology from journal log entries and post individual interviews.

The researcher admits limitations in terms of other psycho-educational factors and demographic profiles that might affect the focused variables of the study since topics employing an LMS have limited resources on scholarly works. Hence, the researcher has taken the advantage of the data and educational theories in published materials accessible online referring to teaching and educational institutions.

Ethical Considerations and Limitations

This study is mainly focused on gathering empirical measurements on the effects of utilizing Gooru Learning Management System in a flipped classroom on the students' achievement in Physics and learning experiences. In addition, this study primarily aims to add to the limited research works on using LMS as a teaching pedagogy and not intended to eliminate existing blended learning approaches. This undertaking may serve as a platform to schools progressing towards implementing flipped classroom models.

The researcher ensures that De La Salle Santiago Zobel School (DLSZ) is suitable as the research locale, since it is considered as a good representative of private schools as an excellent provider of basic education in the Southern Metro Manila, Philippines. In addition, the DLSZ was recognized as an Apple Distinguished School and a Microsoft Showcase School last May 2016, which further supports the school's appropriateness for the study. The researcher ensures the safety and protection of all the participants since there is no known risk posed in this kind of study.

Three (3) intact classes were considered from the Grade 10 students of De La Salle Santiago Zobel School during the first trimestral term of the school year 2016-2017. The intact classes composed of heterogeneous students in terms of intellectual abilities are handled by the researcher; thus, purposive sampling was utilized in selecting the student participants for convenience in time and easy accessibility of information. Moreover, the class schedules of the other two (2) Physics teachers in the research locale did not match the researcher's available time; hence, cannot monitor the progress and implementation of the other classes simultaneously. During the first day of classes, the research respondents were informed regarding the conduct of study by providing them and their parents with consent forms indicating the purposes and duration of the study. This study was conducted over a 4-week period and the participation of the students is completely voluntary. Research participants are free to decide to participate or not and can decline at any time, and any information provided will not be shared with other organizations or individuals. All data collected were used for the purposes of this study and were treated with high level of confidentiality. The participants were not identified in any reporting of the findings but instead coding system were observed in representing their responses from journal entries and interview procedures. Decisions made by the participants had no adverse effects on their performance in the subject. Students and parents who agreed were included in this study but everyone used the Gooru as an LMS in carrying out classroom instructions using the flipped classroom model.

In the duration of the study, an instructional module termed as Next Generation Blended Learning (NxGBL) module was utilized by the researcher in carrying out the flipped classroom model using Gooru for 20 days. The flipped classroom activities using the LMS will approximately run for 20 to 30 minutes a day depending on the line up of Gooru tasks which are reflected in the prepared NxGBL module. The allotted time for each Gooru playlist is flexible since the participants are free to study the assign collection depending on their pace. The NxGBL module are composed of three main topics namely: (1) Uniformly Accelerated Motion – Horizontal Motion; (2) Uniformly Accelerated Motion – Vertical Motion and (3) Projectile Motion. Developed NxGBL modules were validated by experts to ensure that the performance and content standards are properly aligned to the learning materials and activities.

The validators ensured the appropriateness of the prepared module to the target respondents. Reflective journal logs were answered by the research participants at the end of each main topic. After all topics were covered, individual and group interview sessions were held for the upper and lower 5% of the total number of research respondents based on their posttest scores which lasted for 15 minutes per session.

To ensure that conflict of interest is avoided, the researcher was not involved in any act concerning fraudulent activities that will compromise the quality and authenticity of the study. In addition, the presence of the principal and the science coordinator were requested to observe the researcher's classes to guarantee the validity of this claim.

The researcher plans to share the findings of the study to the participants and to the community by participating in DLSZ's research colloquium. Yearly, the school holds a simple community forum which involves all the teaching personnel and administrators. The researcher plans to invite the participants in the study, participants' parents and other nearby school personnel who primarily aim for the awareness of the results and its impact to the community. A poster which includes the findings of the study will also be distributed to the participants of the forum and will also be published through online portals. In addition, the researcher intends to present the results of the study locally and internationally by participating in established research-oriented organizations. Results of the study may be used by the other Philippine schools implementing the same program and of learning environment but not to debase the teacher education programs for ICT education.

Definition of Terms

The following terminologies with their corresponding definition are utilized in the context of this present study:

Achievement. It refers to the raw scores of students obtained in the achievement test on kinematics.

Achievement test. The validated teacher-made test developed to determine the mean gain in the students' scores on kinematics.

Attitude. Students' interest and enjoyment toward the utilization of LMS and whether this helped them in their learning as preparation for classroom activities and assessments (Pardamean et al., 2013).

Flipped Classroom (FC). It is one of the blended learning models, which emphasizes student-centered learning activities. It provides students with self-paced learning environment. Through self-paced learning, students can learn according to their learning ability by using technology as an intermediary (Rahman et al., 2015).

Flipped Learning (FL). It is an instructional model in which technology is used to shift direct instruction outside of the group learning space to the individual learning space (Jensen et al., 2015).

Gooru Learning Management System (GLMS). It is a learning navigator to empower students with actionable information so that they will learn through the approach at which they learn best. This enables students to experience worldwide community for it brings the ability to access and navigate huge information and crowd-sourced educators' contribution. (Gooru, 2016)

Independent Study Skills. It is a general set of skills that refers to the ability of students to manage their own learning. This requires students to manage their own time, workload and deadlines for effective participation in teaching and learning activities. It is developed by helping students enhance their self-regulated learning skills (Field et al., 2014).

Learning Experiences. This term refers to any interaction, course, program, or alternative experiences during which learning takes place, whether it happens in traditional or nontraditional settings, or whether it includes traditional or nontraditional interactions (Abbott et al., 2014). It is operationally defined as the students' independent study skills and attitudes on the use of technology which shall be gathered from their on-line reflective journal.

Learning Management System (LMS). According to Chang (cited in Bousbahi & Alrazgan, 2015). This is a software application used to deliver on-line material and training programs to students while tracking their progress and generating related reports.

Self-Regulating Learning (SRL). It is a construct that includes several aspects of educational learning and provides a lot of general views of the skills, knowledge and motivation that students acquire (Paris & Paris, 2001). It is usually related to independent study skills that when increased, would create them a lot of independent learners (Anand, 2015).

CHAPTER 2

REVIEW OF RELATED LITERATURE

To enrich this research and establish its importance, the researcher has collected, reviewed and analyzed related studies from the available related literature and research studies that provided the researcher with a significant amount of information on the problems under study.

Learning Management System and Gooru

The appropriate use of technology is driven by pedagogy, not technology. According to Oblinger (cited in Thoms, 2013), it is the learning activity that makes learning appealing for the Net Gen. On the other hand, Park (2015), presented the ideas and characteristics of an online learning as viewed by the different authors: (a) Knabe and Wang (2014), c*haracterized online learning in terms of its adaptability in delivery and receptiveness;* (b) McKimm, Jollie and Cantillon (2003), *referred to it as something identical, therefore transposable with web-based and e-learning because of its prominence on online course of study, certain academic formations and the use of technological tools and procedures;* (c) Oliver, Herrington and Reeves (2006), *highlighted that online learning is often distinguished as "blended learning" or "hybrid learning" used in juxtaposition with conventional educational transformations;* (d) Knabe (2004); Nam and Smith-Jackson (2007) and Reushle and McDonald (2000), *insinuated that because of the versatile interactivity and conversational scaffold, online learning* *environment is examined as adequately useful and effective to inculcate quality learning substances independently of conventional methods.*

Spender (cited in Jamlan, 2004) presented several reasons for adopting and executing e - Learning into an educational system:

1. *Education and learning is conveniently achieved through an e-Learning, therefore expanding the knowledge of information technology.*
2. *e – Learning provides effortless access to resources to both teachers and learners anytime, anywhere.*
3. *It also caters to those learners who are physically challenged as an alternative learning method.*
4. *e – Learning can strengthen conventional classroom techniques thereby saving important resources and increasing the beneficence to larger counts of campus - based learners.*

In light of the above concern, Kabassi et al. (2016), suggested that LMS seems to offer a very good solution as the instructors have the capacity to plan and carry out their courses as they desire which makes the blended learning excellently sustained. Furthermore, online learning relies on ICT to deliver the curriculum via LMS. It is used as a platform to deliver content materials and assessments that are distinguished by synchronous (e.g. online chat) and asynchronous (e.g. blog) modalities (Park, 2009). The strategic use of synchronous and asynchronous and integrated modalities can facilitate higher quality communication between students and teachers (Park, 2009). In addition, online learning occurs through an LMS that offers flexible and accessible learning applications. These are standardized applications, but they are not always adaptable to the educator's teaching and learning objectives.

Bidarra and Dias (cited in Berruecos, 2004) pointed out that LMS highlights a range of pedagogical and technical issues such as hardware and software purchases, student support services, student interaction, learning and design theory, student assessment, security and firewalls, staffing and instructional strategies. Its aim is to furnish an information system that efficiently manages students, teachers, course materials in an online environment and course administration. In addition, Garber (2004) emphasized that a virtual learning community may not always allow the students to participate and benefit from it. The teacher or facilitator must play a flexible role by developing active and engaged learners in the community process. On the other hand, Bonk and Reynolds (cited in Ally, 2004) mentioned that, it is the instructional strategy that influences the quality of learning. They asserted that in order to promote higher-order thinking, online learning must create provoking activities that prepare the learners to connect new information to old, acquire substantial knowledge, and use their metacognitive capabilities. In addition, online learning has many promises which requires commitment and resources, and it must be done right. In order to achieve this, adequate support must be provided, online learning materials must be designed properly with the learners and learning in focus and this is what "*Doing it right"* means (Rossett, 2002). Furthermore, Ring and Mathieux (cited in Ally, 2004) suggested that online learning should have immense authenticity (i.e., students should learn in the context of the workplace), tremendous interactivity, and high collaboration.

According to Chin and Williams (2006), in order to achieve the desired learning outcomes, an educator must assure that the learner has a significant and notable learning experience. The proposers also made mention of a significant supposition in which learning will not naturally emerge from one specific source because it will occur through varied means for various people. Thus, the greater scope for catering to individual learning needs is one of the great strengths of the online learning space and that is through securing the power of the various ICT. As cited by Kabassi et al. (2016), Students are able to understand the subject being taught better through the utilization of the various methods in teaching and learning. In line with this, the rules and goals of the course should be clear to them and teachers should give them a self-paced learning for a greater resilience (Ginns et al. 2007; Macedo-Rouet et al. 2009; López-Pérez et al. 2011). Hence, blended learning should be espoused by Learning Management Systems (LMSs) in order to be effective.

Kabassi et al., (2016) presented in their paper the following tools in an LMS, such as WebCT (www.webct.com) and Cyber University of NSYSU (cu.nsysu.edu.tw), Moodle, Blackboard System and e-class. It includes formative and summative assessment, asynchronous and synchronous communication, and content development and delivery.

Furthermore, Leventidis et al. (2005) and Georgouli et al. (2005) contend that the fusion of distance learning tools and the open source e-learning platform e-class enhances the conventional teaching methods and gave way in the educational scheme by encouraging the synergy among teachers, students and educational material. In addition, Papazoglou et al. (2005) and Spathopoulos (2007) concluded that e-class platform was convenient and has economically been utilized to supplement a conventional classroom with a virtual one. Through this, the students felt that the teaching quality has been made better and the supplement had significantly lessened the time allotted in administering and supervising the subjects taught. A study of Tsiakas et al. (2005) disclosed that rather than merely reacting and absorbing, students' interests should be stirred and encouraged in order to cultivate dynamism and seek knowledge through the use of each innovation in the field of education that draws students' attention. Moreover, Vassilakis et al. (2005) concluded that the users of distant resources are more productive and progressive in the asynchronous e-teaching environment since access to distant resources is becoming a common place for them although they have not fully taken advantage of it yet.

In the analysis of the study of Kabassi et al. (2016) the positive effects of the LMS in students and instructors were revealed through the use of the platform Open eClass in institutions for Higher Education in Greece. Moreover, as an advantage, the utilization of the LMS improved the teaching quality by promoting blended learning. Truly, many other studies proved that the platform played a significant role in the educational process as a supplementary tool.

According to Sahrir et al. (2016), an LMS is an integrated, comprehensive software that reinforces the delivery, development, administration and assessment of courses in conventional face-to-face, online or blended learning environments. The LMS is also found to sustain blended learning environment as reported by Ssekakubo, Suleman and Marsden (cited in Sahrir et al, 2016). In the year 2009, Lonn claimed that LMSs can assimilate functionality that supports interaction between and among students and instructors (West, Waddoups, & Graham, 2007) to deliver opportunities for allowing institutional coinage in learning and education

(Dutton, Cheong, & Park, 2009). Furthermore, LMS is adopted by today's generation of students since it is equipped with tools for the kinds of effective online engagement (e.g., discussion tools, chat rooms, wikis, and blogs). The tools within LMS deliver circumstances for utilizing these systems coherent with constructivist approaches that stimulate students to construct their own understandings of the world, instead of the direct transmission of knowledge models of learning that most of the time fail to involve and motivate the learners (Papastergiou, 2006). More people are researching how the embedded ideas of user-generated content, network effects of mass participation, openness and low barriers to entry can be applied to traditional education axioms like student engagement, interaction in learning, and student ownership and management of learning. (Mason & Rennie (cited in Knight, 2010).

In spite of the fact that LMS are increasingly essential applications for teaching and learning process (Salaway, Caruso, & Nelson cited in Lonn, 2009), very little information is known about how these systems stimulate student learning (Koszalka & Ganesan cited in Lonn, 2009). More specifically, results of the study of Lonn (2009) showed that biology students effectively used LMS as a platform to collaborate and construct knowledge in order to accomplish course-related group projects. LMS tools were found to be functional in terms of online collaboration and project completion, even though there was only little pieces of evidence on building knowledge. Likewise, Psycharis et al. (cited in Cavus & Zabadi, 2014) investigated the role of e-learning as a pedagogical tool for changing initial conceptions when learning about physics by using the learning management System of the Moodle platform. Furthermore, the results show that students had intense attitudes towards blended learning, but this was not reflected upon their intention to further use of the LMS.

In another study, Chowdhry et al. (2014) found out that modules in engineering established in a virtual learning environment (VLE) showed correlation to the students' achievement in the course. Furthermore, they recommend a continued improvement in developing well-constructed technology based plans to enhance student learning experience. Likewise, Kidney et al. and Psycharis, (cited in Cavus et al., 2014) found that LMSs are deemed to be relevant to a great extent for natural sciences as they promote experimental study, allow portrayal of phenomena and empower the creation of models and problem solving applications. Additionally, this current pedagogy, in the discipline of science teaching and learning, utilizes: High-order learning and thinking skills, a constructivist technique to science teaching and learning, and communication, information, and scientific literacy skills using digital means and advanced technologies. Also, teaching in an e-learning environment can commit to the ability to learn, the ability to teach and most importantly, to bridge between two main components in the classroom, the teacher and the learner.

Students engaged in the flipped classroom are found to match the performance or better on physics achievement test. On the other hand, students who initially struggled with the new format adapted the flipped classroom quickly and found the format to be effective Sengel (2014). The students who are engaged in flipped classroom model were willing to take the course with different teaching models, especially discovery learning, problem - based learning and individualized learning strategies.

In the recent study of Emelyanova & Voronina (2014), it was proven that some of the students do not trust the objectivity of the system and are not disposed to be gauged through LMS basing on the students' perceptions of the grades received through LMS. They do not really view it as a true manifestation of their academic advancement. On the other hand, other students would like to have a chance to get a higher grade for their tests or other assignments because they recognize the system as a more objective tool of assessing their achievement. At the same time, for teachers, the situation here is somewhat controversial. A number of teachers depend too much on LMS because they perceive it as an additional tool of students' academic achievement. As a result, some students become less involved because they feel a lack of control of their progress. In addition, Martín and Fernández (cited in Cavus & Zabadi, 2014) developed an online learning community which aids both teachers and students to have a virtual space where they can impart knowledge through various kinds of supervised activities, chats and forums in which positive results were evident. The online Physics course helps them boost their abilities and knowledge. Reviews of research point to studies providing evidence that teaching and learning with LMS results in improvement in some or all of the following: Motivation, stimulation, attitude, interest, engagement, focus of task, confidence, enjoyment, persistence, commitment, responsibility, and behavior (Mahnegar, cited in Cavus & Zabadi, 2014).

Learning Management Systems confirmed to fortify a constructive approach to knowledge acquisition and support active learning (Emelyanova & Voronina (2014). Constructivism starts from the idea that the knowledge is composed of the interaction of facebook the individual with the social and physical environment, by virtue of its action and not by any prior endowment, nor the information that the student receives at classroom by the teacher (Piaget cited in Duffy & Jonassen, 2015). Moreover, Papastergiou (cited in Lonn, 2009) reiterated that direct transmission of knowledge models of learning often fails to engage and motivate learners compared with the LMS that provides opportunities for using these systems according to constructivist approaches and more importantly, it encourages students to build their own understandings of the world. In addition, LMS may help ignite a shift from "the transmission of information towards the management and facilitation of student learning" Coaldrake & Stedman (cited in Lonn, 2009). Furthermore, social and collaborative learning enables students to construct a deeper understanding of material and lead to outcomes not possible in a strictly top-down learning environment. (Papert, 1980; Vygotsky and Rogoff, cited in Knight, 2010).

Khan (2011), stated in his thesis that ICT support tools play an important role in constructivism based blended learning environment. According to him, engaging in a variety of effective and interactive ICT tools, such as online interactive whiteboard, online conference system, discussion forum and chat system, in implementing and executing learning activities enables and expands communication, interaction, collaboration, and knowledge construction and sharing among the students had improved learning outcomes and quality.

Moreover, results from the study Palao et al., (2015), revealed that the use of ICT video feedback has made notable developments in the performance of their students. As observed by Wieling and Hofmam (cited in Preston et al., 2010), students with access to video lectures, in addition to face-to-face learning, can improve academic performance. The use of LMS has positive effects in students' achievement and instructors, same with the use of blended courses in higher education which are said to produce a stronger sense of community than either traditional or fully online courses. (Rovai and Jordan, 2014 and Papazoglou et al., 2005 Tsiakas et al., 2005; Vassilakis et al., 2006; and Kabassi, K. et al, 2016).

There are many new platforms of LMS that are widely used in the teaching and learning discourse; to name a few are: Moodle, Edmodo, Blackboard, Google Classroom, Schoology and the most promising LMS platform which is Gooru. Gooru is a free personalized learning solution that enables teachers to find, remix, and share collections of web resources on any K-12 topic. In Gooru, teachers can support every type of learner to help students reach their full potential by having the following features:

1. find standards-aligned multimedia learning materials;
2. remix web and original content to create custom collections;
3. share collections with students and colleagues to increase your impact; and
4. monitor students' engagement, comprehension, and progress.

In this study, the effectiveness of using Gooru as a platform in discussing Physics concepts will be explored along with the students' learning experiences in using it.

Flipped Based Instruction

Kalantzis and Cope (cited by Chandra and Mills, 2015) described transformative education as the learners' empowerment and commitment through journeys that take students into 'new and unfamiliar terrains', but within 'a zone of intelligibility and safety'. In connection, Anderson (cited in Chandra and Mills, 2015) raised that transitioning from a conventional to a technology-rich learning environment is challenging both for teachers and students, because it usually demands a shift in their roles and responsibility for learning. Hence, studies involving ICT integration in the teaching-learning process have sustained the flare of interest among researchers particularly on the blended learning.

Blended Learning (BL) is perceived to give many advantages to the learners regarding self-paced learning, anywhere access, time management, cooperative learning and research guided learning (Ruiz, Mintzer and Leipzig cited in Md Noh et al, 2015).

According to Colis and Moonen (cited in Rovai and Jordan, 2004), BL is a hybrid of an online learning and traditional face-to-face interaction so that instruction occurs both online and in the classroom, and where the online component becomes a natural extension of traditional classroom learning. It is also described as an adaptable approach to course design that reinforces the blending of different times and places for learning, offering some of the conveniences of fully online courses without the complete deprivation of face-to-face contact. The result is potentially a more vigorous educational experience than either traditional or fully online learning can offer. Rovai and Jordan (2014) concluded in their study that the blended concept of learning is highly consistent with these key areas – reaching out to students through distance education technologies, thinking less about delivering instruction and more about producing learning, and promoting a strong sense of community among learners. Furthermore, they have concluded that BL may be a combination of these key areas as the learning environment becomes more learning-centered, with emphasis on active learning through collaboration and social construction of understanding. Graham (cited in Perez and Riveros, 2014) claims that BL encourages: social interaction; pedagogy; access to knowledge; increased access and flexibility; cost effectiveness and ease of revision; and personal agency;

Cognitive psychology claims that learning requires the use of memory, thinking and motivation and that reflection enacts an essential part in learning. They see learning as an internal process, and assert that the amount learned depends on the amount of effort consumed during the learning process, the processing capability of the learner, the depth of the processing and the learner's existing knowledge structure (Craik & Lockhart, 1972; Craik & Tulving, 1975, cited in Ally, 2004).

On the other hand, Bruner (1966), in his constructivism theory, mentioned that learning is an active process in which learners establish new ideas or concepts based upon their current/past knowledge. In this learning theory, the learner selects and converts information, creates hypotheses, and forms decisions, relying on a cognitive structure to do so. Furthermore, cognitive structure (i.e., schema, mental models) yields meaning and organization to experiences and allows the individual to "go beyond the information given". In addition, he implied that the role of instructors is to try and stimulate students to recognize principles by themselves and shall make sure that the learners are engaged in active dialog. This is by transforming information into a format designed appropriately to the learners based on the curriculum, which is simplified and would allow them to produce new propositions and manipulate information. Moreover, Ally (2004) mentioned that constructivist theorists claim that learners decode information and the world according to their personal reality, and that they learn by interpretation, processing, and observation, and then personalize the information into personal knowledge.

Khan (2011), in his thesis, stated that ICT support tools play an important role in constructivism based blended learning environment. According to him, engaging in various effective and interactive ICT tools, such as chat system, discussion forum, online interactive whiteboard, and online conference system in implementing and executing learning activities expedites and increases communication, interaction, collaboration, and knowledge construction and sharing among the students, had enhanced learning outcomes and quality. Furthermore, he was able to implement the conversation theory, which focuses on the interaction and the communication between the teacher and the students and among the students, in BL environment supports. Moreover, he concluded that applying Conversation theory beside Constructivism theory supported by different innovative ICT tools in BL environment, increases learning outcomes and improves learning quality significantly.

In Anderson's (2003) equivalency theorem, the following points were raised on the interaction mechanism in distance education.

Thesis 1: *Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student–teacher; student–student; student–content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience.*

Thesis 2: *High levels of more than one of these three modes will likely provide a more satisfying educational experience, although these experiences may not be as cost- or time effective as less interactive learning sequences.*

Thesis 3. *Deep and meaningful formal teaching is supported as long as one of the three forms of interaction (teacher–student; teacher–content; teacher–teacher) is at a high level. The other two may be offered at minimal* *levels, or even eliminated, without degrading the educational experience.*

Thesis 4. *Deep and meaningful formal teaching and learning is supported as long as one of the three forms of interaction (content–student; content–teacher; content–content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience.*

A new proposed theory by Siemens (2005) and Downes (2010), attempts to understand learning as a process of linking specialized nodes or information sources that may reside in nonhuman appliances.

Siemens (2005) states that *"Learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing."* This learning theory is closely associated with digital technologies which suggests a new way of learning through networks or nodes. Hence, being constantly linked to new technologies and webworks may enable universal learning (Yodsaneha & Sopeerak cited by Altuna and Lareki, 2015). This theory is supported by Pegrum (2009) (cited in Senior, 2010) who observes that in the world of technology, knowledge is a property of the network rather than an individual control. Teaching methods linked to this theory aim to seize students' attention more, helping them learn more easily and to obtain new contents better through the contribution of many people rather than the participation of only a few, who dominate knowledge. The design of collaborative tasks, the correct management of learning communities and the easy access to information are at the root of this new theory. In other words, if you are engaged to learn, you will be able to digest almost any topic with the aid of digital resources (Benedek & Molna, cited in Altuna and Lareki, 2015).

Research studies that have integrated certain forms of ICT have been shown to stimulate students and contribute to knowledge acquisition (Hastie, Casey and Tarter, 2010; Kibble, 2005; O'Hara, Reis, Esteves, Bras and Branco, cited in Palao et al, 2015). However, Ellis et al. (cited in Lassesen et al., 2014) found that an uncertain, disintegrated notion of the use of BL was associated with a teacher-focused approach, whereas a more cohesive conception of blended context surfaced to stimulate a more student focused approach to teaching.

In the study of Palao et al. (2015), found that the use of ICT video feedback has made notable improvements in the performance of their students. In relation, by making use of the digital video technology, students can now interact with and manipulate video presentation anytime, anywhere, and this makes video lectures a potentially attractive asset in a blended learning approach (Soong, Chan, Cheers & Hu, cited in Preston et al., 2010). Furthermore, allowing students to revisit lectures that they may have missed, or not fully understood. Also, allowing deeper understanding and a more adaptable approach to learning (Brotherton & Abowd, 2004 cited in Preston et al., 2010). As observed by Wieling and Hofmam (cited in Preston et al., 2010), students can boost academic performance if given access to video lectures in addition to face-to-face learning. Blended courses in higher education are said to produce a stronger sense of community than either traditional or fully online courses (Rovai and Jordan, 2014).

In a study by Newhouse (2015), students generally are highly responsive to digital forms of assessment if they have confidence in the hardware and some experience with the software and form of assessment. In addition, teachers are compliant if the benefits to students are clear, execution is simple and software is uncomplicated to learn and the students are able to quickly learn how to use simple types of software required in assessment.

Research results of Hung (2015) indicated that the integration of the Wireless Crossword Fan Tan Game in the collaborative and competitive game-based learning environment leads students to a better interaction between different levels of students. Low achievement students in the experimental group had a better learning performance and a more positive attitude than those in the control group. In addition, the results of the study of Yapici and Akbayin (2012) showed that the BL model contributed more to the students' biology achievement than traditional teaching methods did and that the students' attitudes towards the internet developed statistically significantly.

According to Ally (2004), the following are the benefits of online learning for learners: *(a) can engage in asynchronous and synchronous online learning; (b) time zones, location and distance are not an issue; (c) communicate with experts in the field in which they are studying; (d) can use the Internet to access up-to-date and relevant learning materials, and (e) can complete online courses while working on the job or in their own space*. On the other hand, for the instructors *(a) can direct learners to appropriate information based on their* *needs; (b) online materials can be updated, and learners are will be notified at once; and (c) tutoring any time anywhere.* He also suggested that if designed properly, online learning systems could be utilized to regulate learners' needs and current level of expertise, and to allocate appropriate materials for learners to choose from to attain the desired learning outcomes.

Martyn (cited in Rovai and Jordan, 2004) described a successful BL. It consists of an initial face-to-face meeting, e-mail, asynchronous discussions, weekly online assessments and synchronous chat, and a final face-to-face meeting with a proctored final examination. On the other hand, Dziuban and Moskal (cited in Rovai & Jordan, 2004) reported that blended courses, when compared to traditional courses, had equivalent or reduced student withdrawal rates as well as equivalent or superior student success rates. In addition, according to Khan (2011), the following are the factors affecting BL program's success and efficiency: time flexibility, BL program, student support, administrative support, mix of media and learning styles, learning styles, content, students' and teachers' readiness, technology, evaluation and pedagogic considerations, are the main success factors for BL program.

According to Rahman et al. (2015), the rapid growth of technology has sparked a revolution in the world of education and performs an important role in learning and teaching nowadays. However, the utilization of technology without executing proper pedagogy will not have a big effect. FC is one form of pedagogy that stems from the rapid growth of technology. It is formed from one of the blended learning models that highlights student-centered learning activities. In addition, learning process in the flipped classroom provides students with self-paced learning environment. Through self-paced learning, students can learn according to their learning ability by using technology as an intermediary.

Decades ago, Labbo and Reinking's (cited in Beschorner & Hutchinson, 2013) presented a framework for guiding and interpreting research and technology. They stipulated that researchers should focus their attention on what the digital resources *"might do, to what activities and tasks it might be applied, and on what effects and implication it may have beyond the conventional goals of literacy instruction"* rather than focusing on digital resources as devices. They constructed a framework consisting of the following potential goals relevant to integrating digital technology into literacy instruction:

1. *new digital technologies should be used to empower students.*
2. *new digital technologies should be used to positively transform literacy instruction;*
3. *new digital technologies should be available for literacy instruction;*
4. *new digital technologies should be used to prepare students for literacy of the future; and*
5. *new digital technologies should be used to enhance the goals of conventional literacy instruction;*

According to Chipchase (2013), a growing proportion of face to-face activities can now be improved with mobile and video technologies. Moreover, complementary BL programs, using web-based videos and on-line resources, have been shown to be effective for the acquisition of skills. In addition, the use of educational and mobile technologies is also an important feature of, what has been termed, the ‘flipped classroom (FC)’.

Moreover, Thoms (2013) suggests in his study that in this rich diversity of learning styles and communication strategies, pedagogical strategies engaged with the BL curriculum has emerged as a sound pedagogy and that FC must be a comprehensive learning model exemplifying the goals of traditional synchronous learning and technology-based learning.

In line with this, Rahman (2015) suggests that FC enables educators to move from ‘the sage on the stage’ to ‘the guide on the side’. The basic and simplest form of flipped classroom is students are expected to watch digital resources prior to class. The students are then required to come prepared for class and perform hands-on activities that are related to the digital resources. The digital resources can be in any form such as video, audio or the internet. This allows teachers to spend more time with their students to carry out in-class activities and allow immediate response to students’ needs. Moreover, the following were the problems investigated in the traditional method of teaching: *(a) difficulties in repeating the topic by the teacher; (b) students are unable to complete their requirements; (c) students cannot escalate questions to their teachers when at home.*

According to Garisson and Kanuka (2004), one of the implementation of BL is FC. This approach combines dual teaching modalities namely face-to-face and online learning. Thus, the flipped approach complements student centered learning, and empowered self-regulated learning. In addition, Baker (cited in Nawi et al., 2016) first described FC as “The Classroom Flip” where the lectures are moved outside of the classroom and the “homework” into the classroom. This model of classroom was inspired when it was realized that the students were able to easily obtain the lecture notes online. Baker reduced the amount of lecturing in his class and focused on the students' understandings and application of his course.

Bergman and Sams (2012) described FC as an inversion of conventional teaching where students attend didactic lectures or practical sessions and then are required to complete assignments tasks following the lectures. In the flipped classroom, students are exposed to material outside the class, usually by reading prepared material or watching short pre-recorded lecture videos, with class time used to assimilate knowledge through strategies such as problem solving, discussion or debate.

On the other hand, Day and Foley (cited in Rahman et al., 2015) suggest that pedagogy is an essential element that guarantees learning through the use of technology. Pedagogy that meets the 21st century learning in line with the current technology is BL. Based on the results of their study, FC method is a pedagogical method that has the potential to be executed in education. FC also shows positive impacts to be implemented in a variety of disciplines such as Science, Technology, Engineering and Mathematics. The use of technology in the FC also aids teachers or lecturers to efficiently implement teaching and learning. Furthermore, Nasirun et al. (2015) considered this development as a judicious approach for digital native generation. The exposure of the technology to this generation since the early age requires a new approach to leverage their capabilities in learning. Currently, in Malaysia, the education landscape promotes different approaches related with BL including FC. In their study, it was found out that there were significant differences between groups for satisfaction, efficiency, effectiveness and student interactions. However, there were no significant difference for student engagement and final exam results for both of the studied groups.

Chipchase (2013) presented the following implications of the BL and FC-pedagogical approaches: *(1) advances in information technology have led to the development of massive open online access courses like LMSs; (2) these are more than a simple alteration of the method by which information is imparted. To ensure that students gain the most from these approaches, students require authentic learning spaces where they can work collaboratively with teaching staff to achieve deeper understanding; (3) Finally, these new approaches and the available technology create numerous opportunities for sharing of educational resources.*

In a study by Mortensen and Nicholson (2015) results demonstrated that FC proved to be a positive pedagogical approach to engaging and enhancing the educational experience for today's animal sciences students. Moreover, students taught in a flipped format not only outshined above their peers taught in a more traditional lecture format, but also, students responded overwhelmingly positive to the course survey, and similarly, formal course evaluations went up on questions about instructor availability, amount learned, and stimulation of critical and creative thinking. Results also agreed with other studies that demonstrated improved student learning when courses were taught in the flipped format (Day & Foley, 2006; Zappe et al., 2009; Moravec et al., 2010; Missildine et al., 2013; Tune et al., 2013; McLaughlin et al., 2014).

In the study by Moraros et al. (2015), FC provided more opportunities for students to engage in critical thinking, independently facilitate their own learning, and more effectively interact with and learn from their peers. Moreover, the instructor was given more flexibility to cover a wider range and depth of material, provides in-class applied learning opportunities based on problem-solving activities and offers timely feedback/guidance to students. Hence, students' learning styles and educators' teaching methods must be synchronized (Rahman, 2015).

In a research study conducted by Saad (2014), he found out that application of BL and FC showed positive influence on the students, resulting in developing higher order thinking skill within an enjoyable learning environment. In addition, survey on Microbiology students' perceptions on using the Web 2.0 tools in enhancing learning showed that students were inspired to explore more about microbes and their impact to the world when using the tools learned. Data from students interviewed had shown that learning Microbiology was more effective and enjoyable when using collaborative Web 2.0 tools like mind map, wikis and blogs.

Physics and Flipped Based Instruction

A study by Montalbano (2016), on promoting multimedia in Physics Teaching through an FC model, revealed that some of the LMSs or course wares used in the study are not applicable in specific learning paths. Thus, pre-service teachers should realize and design specific learning paths by carefully choosing the initial materials and establishing the student-teacher relationship.

In Taiwan, on a research study by Sun and Wu (2016), a group of freshman students enrolled in Physics course were asked to use Open Course Ware (OCW) as a platform for FL. The teaching model used in the experimental group was the integration of OCW and an FC while that in the control group was using OCW integrated with a conventional classroom. The results showed that for the learning achievement tests, the scores for the experimental group (the integration of OCW with the FC) were significantly higher than those of the control group (the integration of OCW with a conventional classroom). However, there was no significant difference between the two groups for the teacher–student interactions. Nevertheless, the learners generally found the teacher–student interactions to be positive and high. This was probably due to the course design, where learners had equal opportunities to reach the instructor and the teacher-assistants.

Results of the study of Bates and Galloway (2012) on flipping an introductory Physics course, revealed that students were occupied meaningfully with online quizzes that were set on a weekly basis. The large gains measured by the FCI scores show significant learning has taken place through all formal and informal teaching episodes on the course. In addition, Mzoughia (2015) presented in his study that students recognized flipped course as “effective”. However, different components of the course seem to play equally important roles in helping students learn. Moreover, the students value the interaction with the professor and the laboratory assistants. Also, they long for the traditional lecturing even when they know that they are learning more working on worksheets.

A related research study held at Cornell University, NY, USA in which Environmental Physics was designed as a flipped course. Peer collaboration strategies, experiential learning and just-in-time teaching were also utilized. In-class problems were drawn from both local and global environmental sustainability concerns. Problems included an investigation of Cornell's lake source cooling system, calculations on the energy consumed in irrigation with groundwater in the southwestern United States, and power generated by wind turbines at various locations around the world. Class attendance was impressively high, with at least 84%

of students present at each meeting. Survey results showed that students enjoyed working in groups and found the in-class problems beneficial for incorporating the assigned material. However, some students reported that the workload was too hefty and they preferred traditional lectures to the FC. The instructors were able to actively engage with students and quickly identify knowledge and skill gaps that needed to be addressed. Overall, the integration of current environmental problems and group work into an introductory physics course could help to inspire and stimulate students as they advance their ability to analyze problems quantitatively.

In a study conducted by Sengel (2015), students initially struggled with the new format, but they quickly adapted it and found the FC format to be effective. As a result, students participating in the FC performed better on physics achievement test. Students in FC model were willing to take course with different teaching models, especially problem-based learning, discovery learning and individualized learning strategies. In addition, Ramirez et al. (2014) presented in their work how STEM students perceived learning with an FC model and its main advantages and disadvantages. Results of the study revealed that the main advantages are: (1) motivation for learning; (2) advantage because of previous knowledge to class; (3) better comprehension of the content; and (4) flexibility to learn from the videos. Among the disadvantages mentioned by the students are: (1) technical problems; (2) lack of instant feedback; (3) in reference to internet, software, etc.; and (4) preferred length of videos.

Another related study involving a group of health-related student majors took an algebra-based physics course using a response system Learning Catalytics as an LMS (Smith & McDonald, 2013). This system allows richer problems and includes short answers, sketching figures, highlighting text, numerical or symbolic entries, etc. in addition to the standard multiple choice questions. A direct comparison of student learning for 1200 students who have taken the same tests, 25% of which used the flipped classroom approach, and 75% who took a more standard lecture. Findings showed that there is significant evidence of improvements in student learning for students taking the FC approach over standard lectures. Similarly, inverted classroom appears to have worked well for engineering students using MATLAB which allows students to watch lecture videos, review PowerPoint slides and do hands on active learning style (Ossman, 2014).

Learning Experiences

Researchers in the field of physics education (PER) have done plenty of work on addressing the improvement of student learning. Educational literature in various disciplines such as mathematics and physics has shown the importance of self-reflective activities in science courses (May & Etkina 2002; Zimmerman & Kitsantas, cited in Guo, 2014). Moreover, to determine how to best engage the students, it is important to study and understand the students' learning experiences in a blended course in an FC (Mirabolghasemi et al., 2015). Hence, e-learning environments should be carefully designed to cater to the different learning styles, prior knowledge and self-regulation skills. Self-Regulating Learning (SRL) is a construct which circumscribes many aspects of academic learning and provides more holistic views of the knowledge, skills, and motivation that students acquire (Paris & Paris, 2001). SRL includes intellectual learning strategies for effective study and motivational tendencies for students to learn (Cleary & Platten, cited in Anand, 2015). As studied by Zimmerman (cited in

Nguyen & Ikeda, 2015), SRL is a self-directive process in which students transform their cognitive abilities to academic skills, and learning is a driven process in which students actively participate with major accountability and enthusiasm.

Through journal writing, students' learning experiences are best described and demonstrated by pieces of evidence of metacognitive awareness (Rasekh & Ranjbary, 2003). Moreover, the fact that metacognitive awareness was evident, even in the entries of learners new to the idea of keeping a learning journal, it adds strength to the case in favor of journals -- as a diagnostic tool, an evaluation tool, a teaching strategy, a research method, and a tool for personal and professional development.

According to MacDonald (cited in Guo, 2014), reflective journals make students knowledgeable and control learning by means of evaluating what they know, what they need to know and how they bridge that gap during learning situations. The learner diaries involve manifestations of students' efforts in making sense of events, and serve as a window into their conceptual and emotional engagement with the teaching they underwent (Kawalkar & Vijapurkar, 2015).

Journaling after physics class concept was first introduced at the AAPT New Faculty Experience conference (Desbien, 2011). The benefits of students incorporating journal writing for physics were very encouraging. There are few activities that can outclass journal writing for understanding and supporting the development of student thinking. As Dominguez & MacDonald (2009) pointed out that students' reflection creates meaning.

In addition, reflection is most effective as guided, structured, purposeful activity that occurs on regular basis. (MacDonald, 2009) The strategy of using reflection in physics courses allows students the space and time to contemplate about what they are learning. Although probably not the best for every learning style student (needs further studies), reflection through journal writing is a wonderful way to introduce the community to college students. It can be utilized to help students to set their own goals and to guide their own learning. This ongoing activity provides immediate feedback to both teachers and students; it gives teachers opportunities to gain insight into what their students are thinking and how much they have learned about physics content; therefore, changes in instructions should be made. It also helps students to improve their conceptual understanding of physics and their basic communication skills in written format.

Kahn et al. (cited in Afzalur et al., 2002) noted the following benefits of reflective practice for academic improvement: (i) expansion of personal qualities (e.g. enlarged self-confidence); (ii) improved ability for reflective processes; (iii) improved capacity for practice; (iv) change of practice and (v) establishment of helpful relationships among individuals involved in the reflective processes;

In a study conducted by Derntl and Mazzurana (2010), he used and investigated blogs and their effects as they were integrated into a Learning Management System and were utilized as a method for reflecting on assignments, issues, ideas, and other things of relevance, as well as a tool for virtual community building. He found out that blogging activities seemed to be a good indicator of student performance, which could help teachers and facilitators in identifying "blog lazy" students as potential drop-outs and/or low performers. Furthermore, blogs provide an unexpectedly abundant source of insight into students' learning processes, sharing of personal successes and significant events encountered during the course, including hints about difficult stages in problem-solving processes, information about issues with teamwork, deadlines, and assignment descriptions, as well as valuable feedback on the course in general. In addition, Park (2009) suggests that an online learning occurs through an LMS that offers flexible and accessible learning applications. There are standardized applications, but they are not always versatile to the educator's teaching and learning objectives. It has been acknowledged that such platforms have been effectively used to enable reflective learning processes of individuals and collaborative learning (Griffith & Liyanage, 2008), Herrington & Oliver (cited in Park, 2009). From the students' perspective of participation in online learning, reflective learning through an LMS is vital in considering how to strengthen both students' expression for their individual engagement and connection for collaborative involvement without requiring face-to-face interaction (Park & Son, 2011). It has been acknowledged that such platforms have been effectively used to facilitate collaborative learning and reflective learning processes of individuals (Griffith & Liyanage, 2008); Herrington & Oliver (cited in Park, 2009). The task proposed that students post their work including concepts, artefacts, and ideas then include comment and discuss on peers' work. The task ranged five (5) weeks of the first semester, and formed part of the summative assessment. This requirement was delegated so that students could build connections with peers with a view to heighten collaborative participation in the task over the five weeks' time. The results of his study suggested the following practical implications *(a) for efficient interventions of teachers in an LMS by utilizing real time and historical statistical tools would be useful by motivating students to be performance oriented rather than mastery oriented; (b) teacher's professional and reflective blogging about the learning process where students can also participate would be an* *exemplary technological and pedagogical practice which facilitates students to follow quality engagements; and (c) bridging pedagogical gaps between students' familiarity with digital devices and social media and online learning and teaching;*

As stated by Meyer et al. (cited by Field et al., 2014), the most common predictor of independent learning is "self-regulated learning". Moreover, Zimmerman (cited in Paris & Paris, 2001) defined self-regulation as the self-generated feelings, actions, and thoughts that are planned and seasonally modified to the attainment of personal goals.

Edith Cowan University (cited by Field et al., 2014) explained that evaluating classroom strategies through journals is a way of developing a process for independent learning. In a parallel study done by Field et al., (cited by Anand, 2015) he reiterated that helping students to develop their self-regulated learning skills would make them more independent learners, thus, developing their independent study skills.

Self-regulated learning, widely believed to be critical to independent study, has been shown to contribute to overall performance of students, as well as to lower attrition rates (Bamforth, 2010); (Cleary & Platten, 2013); (Taylor et al., 2008); Wilson (cited in Anand, 2015). Thus, self-regulated learners should have the following skills: planning strategies, monitoring performance, setting goals, managing time, changing the context, attributing causation results, evaluating methods, and adapting future methods, Zimmerman (cited in Nguyen & Ikeda, 2015). Neal et al., (2005), on a study to further examine the psychometric properties of the Short Self Regulating Questionnaire (SSRQ), participants were recruited from an introductory psychology course, and completed a questionnaire packet after three (3) weeks which included the SSRQ. Results indicated that the SSRQ displayed two prominent factors; a goal-setting factor and an impulse control factor. Validity evidence showed differential patterns of relationships between these two subscales and measures of self-control, alcohol use, and alcohol-related consequences.

Journal writing is the best tool to accumulate information on students' learning experiences (Park, 2009). Bricker (cited in Guo, 2014), suggested in the article titled "Reinvigorating Science Journals" adding prompts in Physics classes such as the following:

What is something I discovered for the first time?

What did I find that surprised me?

What happened reminds me of…

What else do I want to know…

What am I wondering about now…

I had trouble with…

In a related study, Al-Rawahi and Al-Balushi (2015) suggested certain components to be included in students' reflective journals. First, the journal must include goals needed to be achieved by the end of each lesson. Literature links self-regulated learning to achieving success since students can monitor their progress towards learning goals (Chen, 2002; Zimmerman, 1990; Eliam & Aharon, 2003; Nicol & Macfarlane-Dick, 2006). The second component includes dialogues with the self, the teacher, and their classmates since these are part of the *discourse space* that the journal writing provides. The interaction between the discourse space and content space involves learners in cognitive processing, which results in the generation of new knowledge through the writing practice (Fink, 1999; Keys, 2000; Nicol & Macfarlane-

Dick, 2006). Another important element is writing down scientific observations which is an effective active learning strategy (Finn, 1999; Nicol & Macfarlane-Dick, 2006). In any journal writing, learners are to present their main conclusions to be able to monitor their understanding to diagnose and overcome possible comprehension obstacles. Making conclusions is part of the *content space* that the journal writing provides. This content space provides teachers with evidence and feedback regarding their teaching (Keys, 2000; Chen, 2002; Eliam & Aharon, 2003; Fingon & Fingon, 2008; Nückles et al., 2009). Furthermore, a journal must also consist their assessments of the level of their understanding of the scientific concepts in the lesson. For writing to produce desirable learning effects in school settings, it should be enhanced with metacognitive prompts such as asking students to reflect on their knowledge, learning processes, and comprehension difficulties (Arsal, 2010; Nückles, Hübner, & Renkl, 2009). Lastly, it is important that self-regulation learning should consider both cognitive and affective domains. The expression of a desire to learn is an example of the affective aspects since it helps students express their feelings and emotional reactions to real-world phenomena (Glynn & Muth, 1994; Myers, 2001; İnan & Yüksel, 2010).

Anand (2015) argues that in order for the students to work effectively individually and collaboratively, they often need assistance to develop independent study skills that will equip them particularly outside formal class time. The study skills development program complemented the content of the subject by focusing on study skills to help students better understand the lecture content. The study aimed to develop students' self-regulated learning skills by engaging with them during their outside class times and spaces by sending a number of text messages at different times over a six-week period. He concluded in his study that it will be an advantage when students are individually provided relevant learning support via mobile learning. So as to support students, it was decided that the first six weeks would be the most appropriate time to carry out the study as students are transitioning from their previous schooling to university. At present time, it is essential for students to develop and apply effective independent study skills where schools embrace more sophisticated student-centered approaches (Dabbagh & Kitsantas, 2004; Field, Duffy, & Huggins, cited in Anand, 2015).

On students' attitudes toward the use of technology, Lukow (2002) presented in his paper that students are of the judgment that the utilization of technologies in higher education can beneficially rebuild learning; however, technologies will never replace lecturers. Results of the study of Pardamean et al. (2013), concluded that performance in graphing theory of the experimental group using the LMS was significantly better than the conventional group. In addition, results showed that Technology Acceptance Model (TAM) domains, a tool to analyze and understand factors that influence the acceptance of the use of computer technology, had a positive correlation with the use of LMS.

In the study of Alharbi and Drew (2014), all the Technology Acceptance Model (TAM) related hypotheses were determined to have positive correlations that are statistically significant. This study showed a positive attitude towards LMS, and the students' intent to use an LMS in their work. Furthermore, the study indicates that when users' perceived ease of use increases, the perceived usefulness increases accordingly. As expected, when academics distinguished LMS as easy to use, they developed a positive attitude towards utilizing it. Similarly, the perceived usefulness increased the degree of positivity toward usage, which subsequently affected the behavioral intention to use. In addition, the findings vary between the user-group and the non-user group. The results show that the non-user group exhibits higher intention towards using LMS. While both groups perceived LMS as easy to use, the statistics manifests that the nonuser group perceived LMS as more useful than the other group.

On a study conducted in UK, Saunders and Pincas (2004) found a link between the students learning experiences and their assessment regarding the value of ICT in helping in their study. The survey was based on a detailed web based questionnaire which was completed by 967 students during a four (4) week period in November/December 2003. The 34 questions were broken down broadly into four (4) sections designed to elicit information and views on: (i) attitudes towards face-to-face teaching; (ii) student ownership and use of personal computers; (iii) student use of email and the Internet generally; (iv) attitudes towards the use of online materials and approaches. Although a number of research respondents indicated that they favor more interactive forms of classroom based teaching, the need to have more time for independent study was also commonly raised. This may be linked to the major reasons that students gave for feeling that online activities should be combined with face-to-face classes, most of which related in some way to having greater opportunity to think about and reflect on what had taken place in class.

Moreover, Sankaran (cited in Shudooh, 2013) investigated student attitudes about Web as opposed to lecture formats and the findings suggest that students tend to enroll in the format according to their attitude and learning strategies. When they do not, learning outcomes are detrimentally affected. The conclusion is that matching course formats with students' attitudes and learning strategies enhances learning performance.

Findings of Al-Emran et al. (2016) revealed that there are significant differences among the students' attitudes towards M-learning with regard to their smartphone ownership, country and age. Furthermore, results indicated that M-learning can be one of the promising pedagogical technologies to be employed in the higher educational environments within the Arab Gulf countries.

In the study of Ardies et al. (2013) it was exposed that interest in technology is significantly positively related to the amount of time that technology is taught for, as well as to the teacher. Parents have a positive impact on several aspects of attitude towards technology when mothers and/or fathers have a profession related to technology. Equally, the presence of technological gadgets at home is a significantly positive characteristic.

Householder & Bolin (1993) revealed that the lack of significant differences between the TEC-Lab and comparison classes in physical science and geometry in January, 1992 gave an early indication that immersion in the TEC-Lab environment was not a hindrance to students. The comparisons made in May, 1992 of all TEC-Lab and comparison classes identified only one significant difference in achievement levels, when the TEC-Lab technology class achieved significantly better than the comparison technology class. Participation in the TEC-Lab project, whether in one of the TEC-Lab classes or in one of the comparison classes taught by the TEC-Lab teachers, resulted in positive changes in attitude toward technology. The shift was consistent, appearing in each of the factors as well as the overall attitude scale.

Psycharis et al. (2013) investigated the role of e-learning as a pedagogical tool for changing initial conceptions when learning about physics by using the learning management system of the Moodle platform. They found that students had strong attitudes toward blended learning, but this was not reflected upon their intention to further use of the LMS. In a study of McKinney, Dyck, & Luber (cited in O'Donnell, 2011) on examining student attitudes about using podcasts, found that students were of the opinion that revising from podcasts was more advantageous than revising from textbooks.

Tosh et al. (2005) concluded that neither age nor gender had a significant effect on the post-secondary students' attitudes toward technology. Completion of a formal technology class, the use of computers and exposure to technology appeared to positively affect community college students' attitudes toward technology.

On the role of the educators, Zanjani et al. (2016) expressed that several effective arrangements are essential to entice users. Results indicate that lecturers' teaching habits and style, designing appropriate tasks and assessment procedure as well as active participation in online activities are important determinants of lecturers' attitude in engaging students with LMS tools.

Rahimi et al. (2015) studied the relationship between students' attitudes toward the online system and their motivated strategies for learning was investigated. The study revealed that the experimental group dominated the control group in the writing post-test. Further, the students were found to have positive attitudes toward using technology to manage their homework and this attitude was established to be related to their motivated strategies for learning. The motivated strategies were found to be analogous to achievement in writing, while attitudes toward the system were not.

Another study by Govender and Dhurup (2014) about the use of LMS indicated that the learners had a positive attitude towards the use of the LMS to support teaching and learning and they were keen for it to be implemented in other subjects.

On the other hand, Buabeng-Andoh and Yidana (2014) revealed in their study that many do not collaborate the technology into their learning although students have positive attitudes toward the benefits of ICT in learning. In addition, the study was able to provide additional pieces of evidence that perceived cost negatively related to students' pedagogical use of technology, but the result was inadequate. This indicates that since many students do not utilize ICT in their learning, they rarely encounter barriers or challenges when it comes to the integration of the technology into their studies.

Synthesis

Blended learning strategy is perceived by students and educators to give many advantages and benefits (Ruiz, Mintzer & Leipzig, 2006); (Rovai & Jordan, 2004); (Palao et al., 2015); (Newhouse, 2015). Such advantages include reviewing missed lectures or not fully understood concepts which would result to deeper understanding of the lessons. Hence, resulting to an improved academic performance (Rovai & Jordan, 2004). In this new trend in education, a new classroom model such as flipped classroom is needed (Rahman et al., 2015); (Chipchase, 2013); (Thoms, 2013); (Baker, 2000); (Bergman & Sams, 2012); (Day & Foley, 2006); (Nasirun et al., 2015); (Mortensen et al., 2015); (Saad, 2014).

Results demonstrated that flipped classroom substantiate to be a positive pedagogical approach to engaging and enhancing the educational experience of the students (Day & Foley, 2006); (Zappe et al., 2009); (Moravec et al., 2010); (Missildine et al., 2013); (Tune et al., 2013); (McLaughlin et al., 2014); (Mortensen et al., 2015). In addition, this classroom model highlights learning activities that promote critical thinking and motivation among the students with the intelligent use of technology (Rahman et al., 2015).

In the modern day of digital technologies and the birth of the 21st century learners, performing authentic tasks can lead to optimum achievement in schools if proper technology platform is employed to facilitate the teaching and learning process. In developing a 21st century curriculum, teacher-designers should consider appropriate learning tools to cater the needs of the learners and at the same time produce authentic tasks which would enable them to apply concepts learned in the real world. Creating an ideal learning environment entails the effective use of interactive platforms or Learning Management Systems (LMSs) enabling the learners to interact with the content, instructor and other learners (Kabassi et al., 2016); (Park, 2009); (Griffith & Liyanage, 2008); (Kabassi et al., 2016); (Papazoglou et al.,2005); (Tsiakas et al., 2005); (Vassilakis et al., 2006); (Sahrir et al.,2016); (Lonn, 2009); (Papastergiou, 2006); (Emelyanova & Voronina,2014); (Lonn, 2009); (Psycharis et al., 2013); (Chowdhry et al., 2014); and (Sengel, 2014). Furthermore, employing new pedagogies and technologies will result to a meaningful gain of knowledge, make meaning and deeper understanding from the learning experience (Kabassi et al., 2016); and (Park, 2009) through reflective journals (Graham, 2003); (Guo, 2014); (Kawalkar & Vijapurkar, 2015); (Desbien, 2011). Writing reflective journals greatly help students in assessing individual self for direction and in acquiring independent study skills and positive attitudes toward learning experiences in and outside the classroom (Derntl and Mazzurana, 2010); (Meyer et al., 2008); (Paris & Paris, 2001); (Field et al., 2014); (Anand, 2015); (Nguyen & Ikeda, 2015); (Donnell et al., 2011); (Pardamean et al., 2013); (Alharbi & Drew, 2014).

Based on the related studies, blended learning in a flipped classroom approach has been rooted from constructivism theory, wherein students are believed to be responsible in “constructing” their own learning at their own style and phase (Emelyanova & Voronina, 2014); (Piaget, 1968); (Khan, 2011). In LMSs, teachers play an important role since they are the designers of the pedagogies to be employed in a flipped classroom model (Garber’s review, 2004); (Bonk & Reynolds, 1997); and (Rossett, 2002). In addition, different research studies have proven that students’ have a positive attitude in using technology, therefore, a positive effect is expected to the achievement of the digital learners (Donnell et al., 2011); (Pardamean et al., 2013); (Alharbi & Drew, 2014); (Ardies et al., 2014); (Householder & Bolin, 1993); (Psycharis et al.,2013); (Tosh et al., 2005); (Zanjani et al.,2016); (Rahimi, 2015); (Govender & Dhurup, 2014); (Buabeng-Andoh & Yidana, 2014).

Presented related studies and literature are to provide foundation on the effectiveness of blended learning approach using a Learning Management System (LMS) called “Gooru Learning” in a flipped classroom environment. In a flipped classroom environment, students need to accomplish a full-length lesson on a topic following the series of activities and assessments designed by the teacher. Although there were some studies on using LMS in Physics and students’ attitudes toward the use of technology, none has been conducted for Gooru Learning used in a Physics topic. Using LMSs as a platform is an unfamiliar form of lesson development and assessment activities among the Filipino high school students. Hence, this study aims to provide practical quantitative evaluation methods which can be utilized to properly address the needs and demands of the 21st century learners. In evaluating, the study considered two procedures. First is comparing the effectiveness of flipped classroom environment to the efficiency of blended classroom settings. Comparison of the approach being studied to normal setting determines if flipped classroom causes significant improvement to students' output. Second is determining the attitude of the students towards the use of the LMS – Gooru Learning.

CHAPTER 3

METHODOLOGY

This chapter presents the methodology of the study. It covers the method of research, the research respondents, the sources of data and the instrument that will be used in the study as well as the statistical treatment employed in the interpretation and analysis of data.

Research Design

The focus of this study was to determine the effectiveness of Gooru Learning Management System (GLMS) in a Flipped Classroom (FC) on the students' achievement in Physics and learning experiences on the use of technology. The study employed a Quasi-experimental design using the One-Group Pretest-Posttest design. The design involves randomly assigning research participants to three (3) intact classes. The intact classes were pre-tested and post-tested after the treatment condition has been administered. In this design, the effect is taken to be the difference between the pretest and posttest scores. The research design is presented below:

$$O_1 \qquad\qquad X \qquad\qquad O_2$$

Figure 2. The One-Group Pretest-Posttest Design

where;

O_1 = represents the pretest of the group

X = represents the treatment (utilization of GLMS in an FC)

O_2 = represents the posttest of the group

The achievement mean pretest and posttest scores of the intact classes were computed and analyzed.

In addition, thematic analysis was used to explore the positive outcomes of using GLMS in an FC. Data from post individual interviews and journal log entries were utilized to probe students' learning experiences in terms of independent study skills and attitude on the use of technology.

Participants of the Study

Three (3) intact classes were considered from the Grade 10 students of De La Salle Santiago Zobel School during the first trimestral term of the school year 2016-2017. A total of 102 research participants who voluntarily confirmed their participation were considered in this study. The intact classes composed of heterogeneous students in terms of intellectual abilities are handled by the researcher; thus, purposive sampling was utilized in selecting the student participants for convenience in time and easy accessibility of information. Moreover, the class schedules of the other two (2) Physics teachers in the research locale did not match the researcher's available time; hence, cannot monitor the progress and implementation of the other classes simultaneously. Based on the Technology Acceptance Model (TAM) survey, a questionnaire answered before the S.Y. 2015-2016 year ends, the incoming Grade 10 students are generally accepting and ready on the use of LMSs. To ensure safety of the research participants, informed consent forms were given to the students and their parents including the purposes and duration of the study.

Table 1 shows the profile summary of the validators who were asked to validate the developed learning plans using GLMS in an FC, the teacher-made achievement test and the reflective journal.

Table 1
Profile Summary of the Validators: Research Instruments

Research Instrument	Validator	Educational Attainment	Affiliation	Expertise
Learning Plans	1	Doctorate Degree	Philippine Normal University	Culture/Problem/ Challenge Based approach in teaching Physics
	2	Master's Degree	De La Salle Santiago Zobel School	Blended Learning Instruction, General Science Education
	3	with Master's units	De La Salle Santiago Zobel School	Blended Learning Instruction, General Science Education
Achievement Test	1	Master's Degree	Colegio de San Juan de Letran – Laguna	Physics Education
	2	Master's Degree with PhD units	Philippine Normal University	Physics Education
	3	Master's Degree with PhD units	Philippine Normal University	Educational Management, Physics Education
Reflective Journal Template	1	with Master's units	De La Salle Santiago Zobel School	Values Education, Counseling
	2	with Master's units	De La Salle Santiago Zobel School	Values Education, Educational Management
	3	with Master's units	De La Salle Santiago Zobel School	Values Education, Educational Management

Learning plans using GLMS were validated by Physics educators who are familiar with the blended learning instructions used in a flipped classroom, as they are all distinguished technology educators known locally and internationally. Validator 1 is a Doctorate Degree holder in Physics who is knowledgeable in different approaches in teaching Physics and an excellent technology user in classroom instructions. Validators 2 and 3 are grantees of excellence in educational technology, as recognized by the Apple Incorporation and the Microsoft Corporation. The three (3) raters were believed to have the necessary set of skills and expertise to validate the said research instrument.

The teacher-made achievement test was reviewed and validated by three (3) Physics experts who had at least (9) years of teaching the subject. The experts have handled various administration positions which required them to evaluate assessment tools; hence, made them competent to validate the material.

The validators have been affiliated with De La Salle Santiago Zobel School for at least thirteen (13) years, and currently hold administration positions. The raters, who are also physical sciences experts, have handled DLSZ students which enable them to gauge the kind of research respondents considered in this study. Reflective journal questions were aligned to the school's mission and vision statements, and proper choice of words were considered for Grade 10 students.

Research Instruments

Research instruments included in the study are the checklist questionnaires for educational technology experts and science teachers, learning plans using Gooru Learning Management System, reflective journal questionnaire using Google Forms and the teacher-made achievement test in Physics.

1. <u>Checklist Questionnaire</u>

Adapted and modified checklist questionnaires of Hadley (cited in Pantig, 2013) were used in this study. The first checklist questionnaire is a Likert-type checklist used to determine the level of acceptability of the developed learning plans in terms of its overall plan, content, objectives, lesson procedure, assessment tools, activities, and language (see Appendix A). The raters used the scales shown in table 2 in evaluating the research materials:

Table 2
Legend used to Evaluate Level of Acceptance

Scale	Range	Remarks
5	4.50 – 5.00	Very Acceptable
4	3.50 – 4.49	Acceptable
3	2.50 – 3.49	Moderately Acceptable
2	1.50 – 2.49	Least Acceptable
1	1.00 – 1.49	Not Acceptable

The second checklist questionnaire was used for the evaluation of the developed achievement test. The raters evaluated the teacher-made test in terms of questions/items, options/alternatives, language and layout (see Appendix B). The same set of scales shown in Table 2 were used by the raters.

2. <u>Learning Plans using Gooru Learning Management System</u>

The contents of the learning plans were based on the learning competencies of Department of Education K-12's Basic Education Curriculum for Science particularly on motion topics and consistent to the instructional objectives to the teacher made achievement test. Learning competencies include understanding of the descriptors of motion in one and two dimensions, and enhancing problem solving skills involving bodies that are uniformly accelerating. Hence, the following topics are the scope of the study: (1) Uniformly Accelerated Motion – Horizontal Motion, (2) Uniformly Accelerated Motion – Vertical Motion, (3) Projectile Motion (see Appendices C, D and E). In addition, prepared online activities and formative assessments were carefully aligned to the expected goals by the students of De La Salle Santiago Zobel School in relation to its ICT Vision and Mission program.

In preparing the learning plans, the Lasallian NxGen Learning Module format was used as a template. The learning plans used the "Backward Design" since it starts with determining the desired outcomes which will establish the design of curriculum units, performance assessments, and classroom instructions (Wiggins and McTighe, 2005). The learning plan shall follow the three (3) stages of the UbD Framework: Stage 1: Establishing Desired Results; Stage 2: Determining Valid Evidences/ Assessments and Stage 3: Learning Plan Flow. For each topic covered in the study, the learning plan consisted objectives, materials needed for each session, lesson flow, homework and added features such as the Lasallian Guiding Principles (LGPs) and Blended Activities and Tools (Rapatan, 2015). The blended activities or tools feature lists face-to-face and e-learning activities that will encompass all the attributes of a transformative environment. Also, Gooru LMS was reflected as to how it was utilized throughout the duration of the lesson flow. The learning plans were validated by three (3) physics specialists who have expertise in blended learning instruction using an adapted and modified checklist questionnaire of Hadley (cited in Pantig, 2013). The summary of the validators' assessment on the developed learning plans is presented in Table 3 below.

Table 3
Summary of the Validators' Level of Acceptance on Learning Plans and Assessments

Areas	Weighted Mean	SD	Remarks
A. Overall Plan	4.53	0.38	Very Acceptable
B. Content	4.75	0.17	Very Acceptable
C. Objectives	4.75	0.17	Very Acceptable
D. Lesson Procedure	4.62	0.23	Very Acceptable
E. Assessment Tools	4.80	0.18	Very Acceptable
F. Activities	4.53	0.30	Very Acceptable
G. Language	4.53	0.18	Very Acceptable
Mean	**4.65**	**0.08**	**Very Acceptable**

The results showed that the overall evaluation of the Physics experts in all areas using a checklist questionnaire has a mean of 4.65 which is interpreted as "Very Acceptable". It means that the validators accepted the learning plans as suitable tools which included important elements to be observed in carrying out lessons in a flipped classroom model using GLMS. In addition, it can be gleaned from the table that the assessment tools were rated as the highest among the areas, which means that the prepared assessments were appropriate to target the learning objectives presented in each topic. A very low standard deviation of 0.08 suggests that the raters' agreement is highly consistent to each other, giving the researcher an impression that the prepared learning plans are ready for implementation.

Table 4 shows the level of acceptability of the validators on the three (3) sets of learning plans developed by the researcher on the area of overall plan.

Table 4
Validators' Level of Acceptance: Overall Plan

Criteria	Mean	SD	Interpretation
A. The **OVERALL PLAN** of the learning plan:			
1. is written in a clear and understandable manner.	4.00	0.00	Acceptable
2. can be carried out in an actual school situation.	4.67	0.58	Very Acceptable
3. is geared to the level of the students' maturity and abilities.	4.67	0.58	Very Acceptable
4. includes the use of supportive or illustrative audio or visual aids.	4.33	1.15	Acceptable
5. contains the necessary parts of a learning plan of a flipped based instruction.	5.00	0.00	Very Acceptable
Weighted Mean	**4.53**	**0.38**	**Very Acceptable**

In terms of the overall plan, the learning plans obtained a weighted mean of 4.53 which is interpreted as "Very Acceptable". Hence, the validators agreed that the overall plan of the learning plans can be used to carry out lessons in actual school situations, geared to the level of the students' maturity and abilities, and have included the use of supportive or illustrative audio and visual aids. In addition, all validators approved that the prepared learning plans contained the necessary parts of a flipped based instruction, as this criterion was rated a perfect score of 5.00. On the other hand, although the prepared learning plans were agreed to be written in a clear and understandable manner, this criterion got the lowest mean of 4.00 which means that there is a need to improve the cohesiveness of thoughts of the planning to properly execute the indicated lesson procedures.

Table 5 shows the overall evaluation of validators on the contents of the learning plans:

Table 5
Validators' Level of Acceptance: Content

Criteria	Mean	SD	Interpretation
B. The **CONTENT** of the learning plan:			
1. is sufficient and appropriate to the level of the students' maturity and abilities.	4.67	0.58	Very Acceptable
2. is properly aligned to the learning competencies intended for the students' grade level.	4.67	0.58	Very Acceptable
3. includes information necessary for the achievement of the stated objectives.	5.00	0.00	Very Acceptable
4. includes all the essential parts of a NxGBL learning module.	4.67	0.58	Very Acceptable
Weighted Mean	**4.75**	**0.17**	**Very Acceptable**

As regards to the content, it can be gleaned from the table that the validators gave the learning plans a weighted mean of 4.75 which is interpreted as "Very Acceptable". Furthermore, the results revealed that the content of the learning plans is sufficient and appropriate to the level of the students' maturity and abilities, and agreed to be properly aligned to the learning competencies intended for the Grade 10 pupils. In addition, the validators approved that the content includes information necessary in achieving the stated objectives for each topic as interpreted by a combined score of 5.00. The Physics experts, who are knowledgeable in flipped based instruction, agreed that the content includes all the essential parts of a NxGBL learning module. In connection to this, the result manifests that the content includes student-centered learning activities and provides students with self-paced learning environment, by which students can learn according to their learning ability by using technology as an intermediary as emphasized in a flipped classroom model (Rahman et al., 2015) as supported by a standard deviation value of 0.17.

The assessment of the raters on the objectives used in the learning plans are shown in Table 6.

Table 6
Validators' Level of Acceptance: Objectives

Criteria	Mean	SD	Interpretation
C. The **OBJECTIVES** of the learning plan:			
1. are stated to meet both the expected content and performance standards.	4.67	0.58	Very Acceptable
2. are clear, concise, and easily understood	4.67	0.58	Very Acceptable
3. are designed to support identified student "outcomes" for the entire physics subject as stated in the physics topic outline	4.67	0.58	Very Acceptable
4. are appropriately aligned to the developed formative and summative assessments.	5.00	0.00	Very Acceptable
Weighted Mean	**4.75**	**0.17**	**Very Acceptable**

The table shows that the overall rating of the validators about the objectives on the learning plans is 4.75, which is interpreted as "Very Acceptable". The result displays that the validators agreed that the objectives are stated to meet both the expected content and performance standards. In addition, objectives are clear, concise, easily understood, and designed to support identified student outcomes for the entire physics subject as stated in the physics topic outline. Through a carefully thought and stated instructional objectives, learners will know exactly what they are expected to do and will enable the teacher to determine when they have accomplished the task (Meyer et al., 1997). Moreover, the validators approved that the objectives presented are appropriately aligned to the developed formative and summative assessments for having a perfect score of 5.00. In connection to this, proper alignment of objectives increases the probability of giving the students the opportunity to learn and practice the acquired knowledge and skills, and will more likely get “good learning” (“Whys and Hows of Assessment”, 2014).

Table 7 shows the result of the weighted mean of the validators’ assessment regarding the level of acceptability of the learning plans in terms of lesson procedure. A weighted mean of 4.62 was obtained and interpreted as “Very Acceptable” by the validators.

Table 7
Validators’ Level of Acceptance: Lesson Procedure

Criteria	Mean	SD	Interpretation
D. The **LESSON PROCEDURE** of the learning plan:			
1. provides teacher and students logical orientation of the flow of the topic presentation.	4.67	0.58	Very Acceptable
2. emphasizes the active participation of students in the presentation of the lesson.	4.33	0.58	Acceptable
3. indicates clearly activities to be done in class and at home	4.67	0.58	Very Acceptable
4. explains the use of the Gooru Learning effectively in terms of methods, techniques, and learning experiences appropriate to the lesson objectives.	4.33	0.58	Acceptable
5. follows the design features of a flipped based learning.	5.00	0.00	Very Acceptable
6. provides students with opportunities to become actively engaged in the learning process.	4.67	0.58	Very Acceptable
7. is designed to meet student needs, interests, and abilities through the use of Gooru learning.	4.67	0.58	Very Acceptable
Weighted Mean	**4.62**	**0.23**	**Very Acceptable**

It is notable that criterion 5 obtained a perfect weighed mean score of 5.00 which means that the validators agreed that the learning plans included the essential elements of a flipped based learning. In addition, the validators also agreed that the learning procedure provides the teacher and students logical orientation of the flow on how to present the topics in a flipped classroom. Similarly, it was agreed that the presented procedure indicates clearly the activities to be done in class and at home which were designed to meet student needs, interests, and abilities, and to become actively engaged in the learning process. However, although rated as very acceptable by the validators, criteria 2 and 4 got the lowest weighed mean. This means that the materials need to emphasize more how the students to actively participate in the presentation of the lesson and on how the use of GLMS can be effectively observed in terms of methods, techniques, and learning experiences appropriate to the lesson objectives. In relation, it is important that in developing learning plans in a flipped classroom model using an LMS, that the online learning materials and resources are suited for the learners and learning in focus, and adequate support must be provided by the teacher (Rossett, 2002) which is clearly reinforced by a standard deviation value of 0.23.

Table 8 below shows the agreed rating of the validators in terms of the assessment tools included in the learning plans. The overall rating given was 4.80 which means that this area is "Very Acceptable".

Table 8
Validators' Level of Acceptance: Assessment Tools

Criteria	Mean	SD	Interpretation
E. The **ASSESSMENT TOOLS** of the learning plan:			
1. allow the students to draw conclusions consistent with the objectives of the lesson.	4.67	0.58	Very Acceptable
2. allow students to actively participate in summarizing what they have learned.	5.00	0.00	Very Acceptable
3. have varied designs/features to measure students' understanding.	5.00	0.00	Very Acceptable
4. are appropriately aligned to the lesson objectives.	4.67	0.58	Very Acceptable
5. are appropriate to the level of students' maturity and abilities.	4.67	0.58	Very Acceptable
Weighted Mean	**4.80**	**0.18**	**Very Acceptable**

Furthermore, the validators agreed that the assessment tools were properly designed to allow students to actively participate in summarizing what they have learned and have varied designs/features to measure students' understanding, since these criteria obtained a perfect weighed mean of 5.00. Moreover, the assessment tools were believed to allow students to draw conclusions which are consistent with the objectives of the lesson, and appropriately aligned with the lessons' objectives and students' maturity and abilities. In support to this, properly designed assessment tools are needed in a context featuring a well-defined learning outcomes to meet both contextual requirement and students' learning styles and abilities (Leonard & Fitzgerld, 2016). A very low SD value of 0.17 suggests that all the items included in this area were rated cohesively by the validators agreeing on the points presented above.

Presented in the table below is the validators' assessment in the area of activities of the developed learning plans.

Table 9
Validators' Level of Acceptance: Activities

Criteria	Mean	SD	Interpretation
F. The **ACTIVITIES** of the learning plan:			
1. are aligned with the stated objectives	4.67	0.58	Very Acceptable
2. are properly designed to support the scaffolding/incremental process leading to the desired students' outcomes for the lesson	4.33	0.58	Acceptable
3. are varied to address student differences.	4.33	0.58	Acceptable
4. are suited to the students' learning habits in class or at home.	4.33	0.58	Acceptable
5. follow the design features of a flipped based learning.	5.00	0.00	Very Acceptable
Weighted Mean	**4.53**	**0.30**	**Very Acceptable**

A weighted mean of 4.53 was given to the activities included in the developed learning plans using a flipped classroom model, which is interpreted as "Very Acceptable". The validators agreed that the learning activities followed the design features of a flipped based instruction based on the obtained mean of 5.00. Moreover, the learning activities at home and in classroom were properly designed to support the scaffolding/incremental process in leading the students' desired learning outcomes, and were agreed to suit students' learning habits. Also, the raters approved that the varied activities are aligned with the stated objectives which will address students' differences. Staker and Horn (2012) also support the results by stating that the blended learning activities in an FC must include essentials such as learners' control over time, place, path, and/or pace since it will enable the learners to choose the location and to control the pacing at which they navigate the online materials.

Table 10 shows the validators' agreement in the area of the language used in the learning plans.

Table 10
Validators' Level of Acceptance: Language

Criteria	Mean	SD	Interpretation
G. The **LANGUAGE** used in the learning plan:			
1. is easy to understand	4.67	0.58	Very Acceptable
2. avoids too much technical terms	4.67	0.58	Very Acceptable
3. is free of misspelled words	4.67	0.58	Very Acceptable
4. is free of grammatical errors	4.33	0.58	Acceptable
5. provides instructions that are easy to follow	4.33	0.58	Acceptable
Weighted Mean	**4.53**	**0.18**	**Very Acceptable**

The table revealed in general that the validators accepted the learning plans in terms of the language used as "Very Acceptable" as indicated by a weighted mean of 4.53. Furthermore, results revealed that the language used in the developed learning plans is easy to understand, avoids too much technical terms and free of misspelled words, so that the implementers can easily understand what is being conveyed in the procedures involving flipped based instructions. Moreover, the materials were approved to be free of grammatical errors and clearly provides instructions that are easy to follow, this is to evidently indicate the activities to be done by students and teachers at home and in classroom.

The researcher also considered the validators' overall agreement on all the areas in the checklist using Cronbach alpha which will determine the consistency of the level of agreement among the validators in all areas. The table for the verbal interpretation for a given range of Cronbach alpha values (Gliem & Gliem, 2003) is shown in Table 11 and the result is shown in Table 12.

Table 11
Verbal Interpretation of Cronbach alpha values

Cronbach alpha values	Remarks
0.00 – 0.49	Unacceptable
0.50 – 0.59	Poor
0.60 – 0.69	Questionable
0.70 – 0.79	Acceptable
0.80 – 0.89	Good
0.90 -1.00	Excellent

Table 12
Validators' Agreement on the Evaluation of the Learning Plans

Areas	Cronbach alpha	Remarks
A. Overall Plan	0.83	Good
B. Content	0.89	Good
C. Objectives	0.89	Good
D. Lesson Procedure	0.78	Acceptable
E. Assessment Tools	0.83	Good
F. Activities	0.83	Good
G. Language	0.83	Good
Weighted Mean	**0.84**	**Good**

The inter-rater agreement for the set of learning plans is rated as "Good" by having a weighted mean of 0.84. This value clearly indicated that the learning plans were ready for implementation inside the classroom. The lowest among the areas is the lesson procedure which obtained a 0.78 value and interpreted as “Acceptable”, which can be ascribed by the fact that the validators came from a varied range of years of teaching experiences, age, and skilled backgrounds. The validators are familiar with the blended learning instructions used in a flipped classroom model as they are all distinguished technology educators known locally and internationally.

3. <u>Reflective Journal and Post Individual Interview Questionnaires</u>

In probing students’ learning experiences in terms of independent study skills and attitudes on the use of technology, the Google Forms was used and post individual interviews were held (see Appendices F and G). At the end of each focus topic, students answered questions regarding their learning experiences on the usefulness of the GLMS, on how the LMS helped them in understanding the concepts, and their intentions of using it.

This study adapted the modified online reflective questionnaire format presented in the study of M. Al-Rawahi and S.M. Al-Balushi (2015), Park (2009) and Anand (2015) which are based on the learning strategies associated with self-regulation and are gender-free biased. The reflective journal and post individual interview questionnaires are shown in Appendices F and G respectively.

Similar to the evaluation of the learning plans, the initially developed reflective journal questionnaire had undergone validation process by three (3) experienced Science teachers. The raters were asked about their level of acceptance on the developed reflective journal questionnaire. The researcher also calculated the Cronbach alpha values (Table 12) for the inter-rater agreement in each area being measured by the checklist questionnaire. Table 13 shows the level of acceptability of the material.

Table 13

Summary of the Validators' Level of Acceptance of the Reflective Journal

Areas	Weighted Mean	SD	Remarks
A. Questions	4.58	0.63	Very Acceptable
B. Language	4.56	0.17	Very Acceptable
C. Layout	4.83	0.19	Very Acceptable
D. Usefulness	4.93	0.15	Very Acceptable
Mean	**4.73**	**0.18**	**Very Acceptable**

The reflective journal obtained a mean of 4.73 which is interpreted as "Very Acceptable". Results revealed that the validators considered the material to be useful in terms of probing students' learning experiences in terms of independent study skills and attitudes on the use of technology. The mean value evidently shows that the prepared reflective journal template both for individual and post-interviews were suitable tools for this study as this is reinforced by a standard deviation value of 0.18.

The following tables display the different results of the different areas in the checklist questionnaire. Table 14 summarizes the validators' assessment in the area of questions.

Table 14

Validators' Level of Acceptance: Questions

Criteria	Mean	SD	Interpretation
A. The **QUESTIONS** of the developed reflective journal:			
1. are briefly and clearly stated	3.67	0.58	Acceptable
2. are significant to the attainment of the objectives of the study	5.00	0.00	Very Acceptable
3. cover the students' insights and experiences in the classroom	5.00	0.00	Very Acceptable
4. are relevant to the competencies to be learned by the Grade 10 students	4.67	0.58	Very Acceptable
Weighted Mean	**4.58**	0.63	**Very Acceptable**

The raters' evaluation showed that the questions included in the reflective journal are "Very Acceptable" as indicated by a weighted mean of 4.58. The validators agreed that the prepared questions were significant to the attainment of the objectives of the study and duly cover the students' insights and experiences in the classroom as reflected both by a mean perfect score of 5.00. In addition, it was agreed that the reflective journal questions were relevant to the learning competencies, which is consistently rated together with criteria 2 and 3. On the other hand, a few suggestions were considered by the researcher as regards to the choice of wordings and line of thoughts to effectively measure the research respondents' learning experiences. In particular, one expert said:

> *"The reflective journal is a very useful and effective self-assessment tool. Some statements may need to be reconstructed to make them clearer to the students."*

Table 15 displays the validators' agreement in the area of the language used in the reflective journal.

Table 15
Validators' Level of Acceptance: Language

Criteria	Mean	SD	Interpretation
B. The **LANGUAGE** used in the developed journal activity log			
1. is easy to comprehend	4.67	0.58	Very Acceptable
2. avoids too much technical terms	4.67	0.58	Very Acceptable
3. is within the context of the Filipino students	4.33	0.58	Acceptable
4. is free from misspelled words	4.67	0.58	Very Acceptable
5. is free from grammatical errors	4.33	0.58	Acceptable
6. provides instructions that are easy to follow	4.67	0.58	Very Acceptable
Weighted Mean	**4.56**	**0.17**	**Very Acceptable**

A weighted mean of 4.56 was rated on the language used in the reflective journal which is interpreted as “Very Acceptable”. The validators accepted that the language is easy to comprehend, avoids too much technical terms, and is free from misspelled words and grammatical errors. In addition, this area is agreed to be intended within the context of the Filipino students and provides instructions that are easy to follow. However, none of the criteria was rated a perfect mean score unlike the other areas, which suggests that this part needs to be improved as reflected by a standard deviation value of 0.17. The following comments from the validators were taken into consideration before the researcher asked the students to answer the material:

“The addition of descriptors next to the icons may help capture the students’ evaluation of the different items in the journal.”

“A further suggestion would be to include questions that are more specific to the competencies that the students are trying to learn.”

Table 16 reflects the summary of the validators’ assessment with regard to the layout of the material.

Table 16
Validators' Level of Acceptance: Layout

Criteria	Mean	SD	Interpretation
C. The **LAYOUT** of the developed journal activity log:			
1. has an appealing organization	4.67	0.58	Very Acceptable
2. uses layout that are creative and appealing to the respondents	4.67	0.58	Very Acceptable
3. shows readability of texts	5.00	0.00	Very Acceptable
4. provides enough and appropriate space for the answers	5.00	0.00	Very Acceptable
Weighted Mean	**4.83**	**0.19**	**Very Acceptable**

The agreed rating of the validators in terms of the layout of the developed reflective journal was 4.83 which is interpreted as "Very Acceptable". The raters approved that the layout of the journal has a creative and an appealing organization to the research respondents. To take note, since the journal feature of the GLMS was in a beta version during data gathering, the researcher opted to use Google Forms which has a similar function to gather their reflections in terms of independent study skills and attitudes on the use of technology. In addition, the validators also agreed that the journal layout shows readability of texts and has enough and appropriate space for the answers, which are all technically possible online as approved by the validators who are also using the same Google product.

The table below shows the summary of evaluation in the area of usefulness of the developed reflective journal.

Table 17
Validators' Level of Acceptance: Usefulness

Criteria	Mean	SD	Interpretation
D. The journal activity log is **USEFUL** in terms of:			
1. ease of reproduction	5.00	0.00	Very Acceptable
2. ease of administering to students	5.00	0.00	Very Acceptable
3. probing students' interest, dynamics and behavior in the classroom experiences	4.67	0.58	Very Acceptable
4. using it as an assessment tool	5.00	0.00	Very Acceptable
5. making it a part of students' learning experiences	5.00	0.00	Very Acceptable
Weighted Mean	**4.93**	**0.15**	**Very Acceptable**

In terms of the usefulness, the reflective journal obtained a very high weighted mean of 4.93 which is interpreted as "Very Acceptable". All validators agreed that the prepared journal is useful in terms of the ease of reproduction and administering it to the students, since the completion of the said material will be done online using Google Forms. In addition, the raters approved that it is very useful as an assessing tool in probing students' learning experiences as all the said criteria obtained a perfect mean score of 5.00. Among the other criteria, a validator suggested to improve its' usefulness in probing students' interest, dynamics and behavior in the classroom experiences by adding more questions, which was taken into consideration by the researcher in structuring the revised journal.

The inter-rater agreement was also computed by the researcher to determine the cohesiveness of the assessment among the validators using the Cronbach alpha values (see Table 11). Table 18 below shows the level agreement of the validators on the prepared reflective journal.

Table 18

Validators' Agreement on the Evaluation of the Reflective Journal

Areas	Cronbach alpha	Remarks
A. Questions	0.89	Good
B. Language	0.80	Good
C. Layout	0.89	Good
D. Usefulness	0.83	Good
Weighted Mean	**0.85**	**Good**

It can be deduced from the table that all validators have a consistent evaluation of the reflective journal instrument as reflected by the Cronbach alpha value of 0.85, which is interpreted as "Good". This value suggests that the prepared instrument is a suitable tool in probing students' learning experiences in terms of independent study skills and attitudes on the use of technology as supported by one of the comments of one expert:

> *"Overall, the journal is well-constructed and essentially covers what the tool intends to call out from the students."*

Suggestions on the improvement of the material, particularly the language area, were taken into consideration in reconstructing the final version of the instrument.

4. <u>Physics Achievement Test</u>

The achievement test developed by the researcher was used in the pretest and posttest to determine the students' achievement in Physics (see Appendix H). This forced-choice tool has thirty (30) questions which covers the following topics: (1) Uniformly Accelerated Motion – Horizontal Motion, (2) Uniformly Accelerated Motion – Vertical Motion, (3) Projectile Motion. Each question offers only one correct answer with effective distractors. Content validity will be established by presenting the test and objectives to an independent panel of experts to ensure that the learning competencies are adequately covered. Appendix I reflects the item distribution across the learning competencies in Physics. The summary of the validators' assessment on the developed achievement test is presented in Table 19 below.

Table 19

Summary of the Validators' Level of Acceptance of the Physics Achievement Test

Areas	Weighted Mean	SD	Remarks
A. Questions/Items	4.93	0.15	Very Acceptable
B. Options/Alternatives	4.90	0.25	Very Acceptable
C. Language	4.80	0.18	Very Acceptable
D. Layout	5.00	0.00	Very Acceptable
Mean	**4.91**	**0.11**	**Very Acceptable**

The results showed that the overall assessment of the Physics experts in all areas of the achievement test using a checklist questionnaire has a mean of 4.91 which is interpreted as "Very Acceptable". It means that the validators accepted the developed instrument as an appropriate tool to determine students' Physics achievement in terms of the questions included, options presented, language used and the structured layout. The latter item was rated a weighted mean of 5.00, which means that this area is appropriate for the research respondents in terms of the illustrations/diagrams and visual appeal. Consistent with the other research instruments, the language used was rated the lowest, but still obtained a "Very Acceptable" remark, hence, suggestions from the validators were considered for the final revision of the material.

Table 20 displays the validators' level of acceptance in terms of the questions/items included in the developed achievement test.

Table 20
Validators' Level of Acceptance: Questions/Items

Criteria	Mean	SD	Interpretation
A. The **QUESTIONS/ITEMS** of the developed-test:			
1. are briefly and clearly stated	5.00	0.00	Very Acceptable
2. are measurable and attainable	5.00	0.00	Very Acceptable
3. are aligned to the set learning competencies in the TOS	5.00	0.00	Very Acceptable
4. are aligned to the levels of the Bloom's Taxonomy revealed in the TOS (LOTS and HOTS)	4.67	0.58	Very Acceptable
5. are substantial that contains facts to be recalled, table and diagram to be interpreted and problems to be solved.	5.00	0.00	Very Acceptable
6. are helpful in developing better conceptual understanding in Physics	5.00	0.00	Very Acceptable
7. are useful in eliciting common students' misconceptions	4.67	0.58	Very Acceptable
8. are helpful in improving students' critical thinking skills	5.00	0.00	Very Acceptable
9. are meaningful by itself and present a definite problem	5.00	0.00	Very Acceptable
Weighted Mean	**4.93**	**0.15**	**Very Acceptable**

A weighted mean of 4.93 was given to the questions/items included in the developed achievement test which means that it is "Very Acceptable". The physics experts agreed that the prepared instrument contained all the essentials of an achievement test. In addition, everyone approved that the questions were briefly and clearly stated, measurable and attainable, and substantial since these contain facts to be recalled, table and diagram to be interpreted and problems to be solved. Furthermore, the questions included were believed to be helpful in developing better conceptual understanding in Physics and in improving students' critical thinking skills as these questions were meaningful enough to present definite real-life problems. Moreover, the type of questions was agreed to be aligned to the levels of the

Bloom's Taxonomy reflected in the TOS and useful in identifying students' common misconceptions.

The table below shows the evaluation summary of the validators in the area of options/alternatives of the developed test. This area was rated highly with a value of 4.90 which is interpreted as "Very Acceptable"

Table 21
Validators' Level of Acceptance: Options/Alternatives

Criteria	Mean	SD	Interpretation
B. The **OPTIONS/ALTERNATIVES** of the developed-test:			
1. are briefly and clearly stated	5.00	0.00	Very Acceptable
2. are related and relevant to the questions	5.00	0.00	Very Acceptable
3. contain only one best answer	5.00	0.00	Very Acceptable
4. contain good numbers of distracters	5.00	0.00	Very Acceptable
5. contain distracters that are plausible and attractive	5.00	0.00	Very Acceptable
6. are arranged logically	4.33	0.58	Acceptable
7. are grammatically aligned with the question	5.00	0.00	Very Acceptable
Weighted Mean	**4.90**	**0.25**	**Very Acceptable**

Furthermore, the validators agreed that the presented options/alternatives in the research instrument were briefly and clearly stated, related and relevant, and grammatically aligned to the questions. In addition, options/alternatives of the developed test were believed to contain only one best answer and good numbers of distracters, which were considered plausible and attractive to the research respondents. On the other hand, an improvement was done in the material in terms of its logical arrangement of increasing complexity to help the research respondents comprehend the questions as suggested by one of the validators. Raters were consistent in terms of the assessment as reflected by an SD value of 0.25. As regards to the language used in the material, table 22 displays the results of the evaluation among the raters on the developed achievement test.

Table 22
Validators' Level of Acceptance: Language

Criteria	Mean	SD	Interpretation
C. The **LANGUAGE** used in the developed-test:			
1. is easy to understand	5.00	0.00	Very Acceptable
2. avoids too much technical terms	4.67	0.58	Very Acceptable
3. is free of misspelled words	4.67	0.58	Very Acceptable
4. is free from grammatical errors	4.67	0.58	Very Acceptable
5. provides instructions that are easy to follow	5.00	0.00	Very Acceptable
Weighted Mean	**4.80**	**0.18**	**Very Acceptable**

Moreover, the evaluation for the language used in the achievement test was rated as 4.80 which is interpreted as "Very Acceptable". The validators approved that the language intended for the Grade 10 students is easy to understand and provides instructions that are easy to follow. Additionally, it was agreed that the language used is free of misspelled words and grammatical errors, and avoids too much technical terms, which helped the research respondents to comprehend the questions. All the criteria in this area were rated as "Very Acceptable" which means that the language used is appropriate to the level of the students' maturity and abilities in terms of language.

Table 23 displays the level of acceptance of the validators in the area of the layout used in the developed achievement test.

Table 23
Validators' Level of Acceptance: Layout

Criteria	Mean	SD	Interpretation
D. The **LAYOUT** of the developed-test:			
1. has a clear instruction and appealing layout	5.00	0.00	Very Acceptable
2. uses illustrations that help students build and develop clear scientific conceptions	5.00	0.00	Very Acceptable
3. uses illustrations that are creative and appealing to the respondents	5.00	0.00	Very Acceptable
4. shows readability of text	5.00	0.00	Very Acceptable
5. provides enough and appropriate space for the questions and options	5.00	0.00	Very Acceptable
Weighted Mean	**5.00**	**0.00**	**Very Acceptable**

Clearly, the validators agreed that all the criteria in this area were met as reflected in the weighted mean score of 5.00 which is interpreted as "Very Acceptable". The raters approved that the layout has clear instructions and appealing layout, uses illustrations that help students build and develop clear scientific conceptions, and are creative and appealing to the respondents. Moreover, the layout shows readability of text, and provides enough and appropriate spaces for the questions and options.

Lastly, table 24 shows the summary of the evaluation of the validators of the physics achievement test.

Table 24
Validators' Agreement on the Evaluation of the Physics Achievement Test

Areas	Cronbach alpha	Remarks
A. Questions/items	0.75	Acceptable
B. Options/alternatives	0.78	Acceptable
C. Language	0.83	Good
D. Layout	1.00	Excellent
Weighted Mean	**0.84**	**Good**

Evidently, the weighted mean value of 0.84, which is interpreted as "Good", indicates that the developed achievement test was cohesively approved for implementation in the classroom as an appropriate tool for pretest and posttest. As reflected from the table, all validators agreed that this research instrument will answer one of the research questions regarding the students' Physics achievement using GLMS in a flipped classroom.

Research Process

The study was divided into three (3) phases: Phase 1 – Developmental Phase; Phase 2 – Experimental Phase and Phase 3 –Data Analysis Phase. The steps undertaken by the researcher are shown in Figure 4 below. Basically, the figure shows the general procedures from phase 1 to 3 and following is the detailed discussion of each step.

DEVELOPMENTAL PHASE
1. Selection of content topics 2. Development and validation of GLMS learning plans and materials 3. Communication (principal, validators, students and parents)
⇩
EXPERIMENTAL PHASE
1. Conduct pretest: Physics achievement test 2. Implementing the use of GLMS in a Flipped Classroom 3. Conduct posttest: Physics achievement test
⇩
DATA ANALYSIS
1. Preliminary analysis of collected data 2. Analysis of the Physics achievement test scores. 3. Statistical analysis of pre-posttest scores of the intact classes. 4. Analysis of students' learning experiences through reflective journals and post individual interviews.

Figure 3. Data Collection Procedure

<u>Phase 1 – Developmental Phase</u>

The researcher determined a set of topics to be included in the learning plan which have covered the Department of Education K to 12's learning competencies in Physics. Alongside, research instruments were being developed which include the learning plans infused with the GLMS in a flipped classroom, formative and summative assessments, and a reflective journal template. The initial drafts of the developed learning plans, teacher-made achievement test and reflective journal template were checked and validated by nine (9) Science experts, particularly in the field of Physics education, flipped based instructions and guidance counseling, using an adapted and modified checklist questionnaire of Hadley (cited in Pantig, 2013).

The researcher calculated first the weighed mean on each criterion present in the checklist-questionnaire to determine the level of acceptance of the experts who evaluated the learning plans, achievement test and reflective journal template. The Cronbach alpha inter-rater agreement was used to determine the cohesiveness of the evaluation among the validators on all research instruments.

After the development of the revised research instruments, letters of communication, initial drafts of parental and student consents were given to the Principal for the approval of the implementation of the study. In addition, checklist questionnaires were given to the validators for the evaluation and validation of the prepared materials. Afterwards, approved consent forms were given to the students and their parents including the purposes and duration of the study to confirm their voluntary participation in this study. The said procedures were done before Phase 2 began.

<u>Phase 2 – Experimental Phase</u>

During the first day of the school year, the researcher administered a pre-test for the research respondents using the validated teacher-made achievement test in Physics to test their prior knowledge on motion concepts. The students were instructed to answer the test to the best of knowledge they have. In addition, students were asked to form one-seat apart arrangement and to only use their Mobile Learning Device (MLD) when answering the Google Forms format of the achievement test. A brief clarification before the pre-test in which details about the objectives, mechanics, time duration, and other instructions in answering the test were given. The 30-item pre-test were answered for forty-five minutes. The pre-test was automatically checked using the Flubaroo feature of Google sheets to determine the individual scores of the students and were kept online. Data collected from the research respondents were students' names, email addresses, sections and responses. Giving of instructions on the use of the GLMS was conducted after the pre-test.

A series of Gooru playlists were given initially to the students not covering the supposed topics in this study, so that the students will get used with the Gooru's functionality and dynamics. The following parts were followed in carrying out the lesson flow for each day/learning competency: First part includes out-of-class activities which are student-centered and uses online lecture method by means of the Gooru Learning Management System. Second part includes in-class activities which are teacher-centered where synthesizing of concepts learned are conducted. After a set of GLMS activities for each focus topic, the students were instructed to answer series of questions probing the learning experiences they have encountered when using the LMS, in the Google Forms format of the reflective journal. A total of three (3) reflective journal entries were accomplished by each respondent at the end of the duration of the study. The day after the last topic, the intact classes were post-tested using the teacher-made achievement test. Data collected from the research respondents were students' names, email addresses, sections and responses. In addition, post-individual interviews were conducted among those who performed well and poorly in the achievement test, which was determined by the upper and lower 10% of the total number of research respondents.

Phase 3 – Data Analysis

To address research questions 1 and 2, the results for the intact classes were compared, tabulated and would be the reference in determining the effectiveness of the use of the GLMS and their learning experiences. Pretest and posttest scores were compared to determine if the use of an LMS significantly affects the students' Physics achievement using the t-test of dependent means. For research question 3, qualitative data were deduced from journal log entries and post implementation individual interviews to probe students' learning experiences in terms of independent study skills and attitudes on the use of technology. The students who performed well and poorly in the achievement test were asked during in-between breaks or after dismissal to attend a post implementation individual interview for about 10-15 minutes only. This study was conducted over a 4 - week period on collecting data on both achievement and learning experiences, which were interpreted and analyzed to determine the relative effectiveness of using LMS as a platform in education.

Statistical Tools

The data was analyzed using the following statistical treatments:

- Mean and Standard Deviation – The mean was used to determine the average of the students' scores in the Physics achievement test, as well as the ratings of the expert validators using the checklist questionnaire during the validation phase of the learning plans using GLMS, Physics achievement test, and the reflective journal. On the other hand, the standard deviation was employed to measure the dispersion or the homogeneity and heterogeneity of students’ scores in the Physics achievement test and results of the evaluation of the expert validators.

- T-test of dependent means – It was utilized to determine if the implementation of the flipped classroom using GLMS has a significant effect on the performance of the research respondents. It was used to compare the pretest and posttests scores of the group in terms of achievement.

- Cronbach Alpha – It was used to measure the consistency of the evaluation of the expert validators during the validation phase of the different research instruments used in this study.

- Thematic analysis – It was employed to probe patterns and themes of students’ learning experiences in terms of independent study skills and attitudes on the use of technology through online reflective journals. Post individual interviews were conducted among the students who performed well and poorly in the achievement test to further elicit and substantiate the initial results from the reflective journals establishing their learning experiences in a flipped classroom using GLMS.

CHAPTER 4

RESULTS and DISCUSSION

This study was conducted to answer the presented research problems on whether the use of Gooru as a Learning Management System in a flipped classroom produces significant gains in the students' Physics achievement and provides meaningful learning experiences in terms of independent study skills and attitudes on the use of technology.

In this research, significant gains were measured using the pre-test and post-test from a teacher-made achievement test which covered Department of Education's K-12 Physics competencies on kinematics. On the other hand, learning experiences were probed using a reflective journal with questions regarding independent study skills and their attitudes on the use of technology.

The study involved 102 research participants from three (3) intact classes which were considered as one group. Learning plans, teacher-made achievement test and reflective journal template were checked and validated by physics experts and teachers. Before the implementation of the study, students were given Gooru Playlists of topics not covered in this study, for them to get used with the flipped classroom model. The three (3) intact classes were pre-tested using a 30-item teacher-made achievement test covering the select topics in kinematics. All groups were given the same treatment following two (2) parts: First part includes out-of-class activities which are student-centered and uses online lecture method by means of the Gooru Learning Management System. Second part includes in-class activities which are teacher-centered where synthesizing of concepts learned are conducted. After a set of GLMS activities for each focus topic, the students were instructed to answer series of questions probing the learning experiences they have encountered when using the LMS in the Google Forms format of the reflective journal. After four (4) weeks of implementation, the intact classes were post-tested using the teacher-made achievement test. In addition, post-individual interviews were conducted among those who performed well and poorly in the achievement test, which was determined by the upper and lower 10% of the total number of research respondents.

This study aims to determine the effectiveness of using Gooru Learning Management System in a flipped classroom on the students' Physics achievement and learning experiences. The contents of the learning plans were based on the learning competencies of Department of Education K-12's Basic Education Curriculum for Science particularly on motion topics and consistent to the instructional objectives to the teacher made achievement test. Learning competencies include understanding of the descriptors of motion in one and two dimensions, and enhancing problem solving skills involving bodies that are uniformly accelerating. The study included three (3) focus topics on kinematics for Grade 10 students. The topics covered were (1) Uniformly Accelerated Motion – Horizontal Motion, (2) Uniformly Accelerated Motion – Vertical Motion, (3) Projectile Motion.

This section has four (4) objectives. The first objective is to present the pre-test and post-test mean scores of the research respondents for all three focus topics and the overall scores. The second objective is to present the significant gains in the research respondents' scores in their achievement test of each focus topic and the overall scores. The third objective is to discuss the possible explanations behind the results of the statistical analysis from the mentioned objectives. Finally, the researcher will examine patterns and themes on students' learning experiences based on the accomplished reflective journals in terms of physics achievement, independent study skills and learning experiences.

Effectiveness of using Gooru LMS in an FC on Students' Physics Achievement

To determine the effectiveness of using Gooru LMS, Table 25 displays the pretest and posttest mean scores of the group on all three (3) focus topics and an overall summary of the scores.

Table 25
Pretest and Posttest Mean Scores

Topics	Total Number of Items	Pretest		Posttest	
		Mean	SD	Mean	SD
Horizontal Motion	11	2.500	1.501	3.931	2.088
Vertical Motion	8	2.294	1.369	4.578	1.424
Projectile Motion	11	2.637	1.447	3.873	1.571
Overall	30	7.431	2.578	12.382	3.535

According to the results on the above table, the overall pretest mean score of the group is 7.431 out of 30 items, which suggests that the research participants were not familiar yet with kinematics concepts. Although the research participants had a prior knowledge on motion in their elementary years, competencies for Grade 10 level are still new to the students. In relation to this, the low pretest mean scores of the group for the three (3) focus topics, 2.500, 2.294 and 2.637 respectively, suggest that none of the topics have been clear to the students prior to the implementation of the study. Correspondingly, the SD scores suggested that the group had the same knowledge level entry, which is an indication that the research respondents are suited for this study.

As regards to the posttest, an increase in the overall mean score was shown in the obtained value of 12.382 out of 30 items. Although the mean score was not relatively high and did not even reached half of the total number of items, a significant increase was still attained. In addition, this means that there were significant gains in the scores of the three (3) focus topics as indicated in the obtained values: 3.931, 4.578 and 3.873 respectively. Among the topics, the vertical motion has gained the highest score which may be due to research participants' mastery of horizontal motion, which is closely related in terms of concepts and mathematical definition. It is also notable that the projectile motion topic got the lowest gain in scores which may attributed to its complexity, as this required the research respondents to recall bodies moving at a constant velocity and uniform acceleration.

The low pretest results were further supported by a study conducted by Hestenes and Savinainen (as cited in Pantig, 2013) which reported that physics students are expected to have a relatively low performance in the beginning of the course.

Significant Difference on Students' Physics Achievement between the Pretest and Posttest

To see whether the difference between the pretest and posttest scores is significant across the three (3) focus topics, the researcher utilized the t-test for dependent means and the results are shown in Table 26 below.

Table 26
Paired Samples Test

Pair	Pre-Post	Mean Difference	SD	df	t_{crit}	t_{comp}	p-val	Remark
1	Horizontal	1.431	2.353	101	1.984	6.145	.000	Significant
2	Vertical	2.284	1.815			12.710		
3	Projectile	1.234	2.208			5.651		
4	Overall	4.951	4.239			11.796		

$\alpha = 0.05$

The table shows that the p-value of .000 is lesser than 0.05 alpha level as well as the computed t-value of 11.796 which is greater than the critical value of 1.984; thus, there is a significant difference between the pretest and posttest performance of the group using GLMS in a flipped classroom.

As introduced from the previous table, the topic on the vertical motion obtained the highest gain score of 2.284 and had a standard deviation value of 1.815. It means that the students performed well on the topic and observed to be consistent in their answers in the test. Furthermore, it may also suggest that since the students had grasped the basic concepts and mathematical definition of horizontal motion, it would be easier for them to understand concepts on vertical motion. However, their positive performance did not lead to better results on the next topic which is projectile motion. This is supported by a study conducted by Prescott and Mitchelmore (2000), in which it was revealed that among all the Physics topics, students have many misconceptions when it comes to projectile motion, since students tend to develop their own motion theories through the generalization of ideas from observations of certain objects in everyday situations. In addition, it is assumed that since the school held numerous activities with an average of three (3) events per week and classes were suspended due to typhoons, which in turn resulted to a lack of continuity of the lesson flow, the research respondents had difficulty in retaining and connecting both the theoretical and mathematical projectile motion concepts.

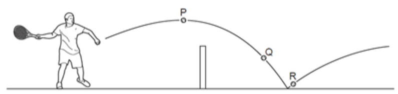
Nevertheless, the results indicated that the method used in this study had positive effects on the achievement of students in physics. The same results were also reported from a variety of previous researchers (Day & Foley, 2006); (Zappe et al., 2009); (Moravec et al., 2010); (Missildine et al., 2013); (Tune et al., 2013); (McLaughlin et al., 2014); (Mortensen et al. 2015) which have supported the effectiveness of using a Learning Management System in a flipped classroom model.

<u>Significant Increase on Students' Physics Achievement between the Pretest and Posttest</u>

As regards to the significant increase in their posttest scores across all items, the researcher computed for the difference between the pretest and posttest scores. Each focus topic consists of two (2) learning competencies taken from the Department of Education K to 12 Basic Education Curriculum for Science. Distribution of items and percentages of time allotment for each focus topic and learning competencies are reflected in the Table of Specifications (see Appendix I). Results are shown in Table 27.

Table 27

Pretest and Posttest Scores Difference

<table>
<tr><th rowspan="2">LEARNING COMPETENCIES</th><th rowspan="2">Item No.</th><th colspan="2">Scores</th><th rowspan="2">Diff</th><th rowspan="2">Sample Test Items</th></tr>
<tr><th>Pre</th><th>Post</th></tr>
<tr><td rowspan="5">1. Explain the conditions when a body is considered to be uniformly accelerating.</td><td>1</td><td>19</td><td>41</td><td>22</td><td rowspan="5">3. A tennis player hits a ball over the net.


In which positions is the ball accelerating?
A. P and Q only
B. P and R only
C. Q and R only
D. P, Q and R

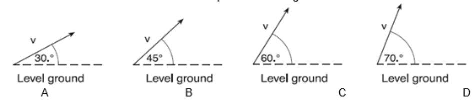
4. Which of the following shows uniformly accelerated motion?
A. a typhoon moving at 10 km/h North of East
B. a car moving without changing its speed along a straight line
C. a stone thrown upwards decreasing its speed by 10 m/s every second
D. a car increasing its speed from rest to 10 m/s after 1 second and speeding up even faster to a speed of 30 m/s in the next second</td></tr>
<tr><td>2</td><td>30</td><td>38</td><td>8</td></tr>
<tr><td>3</td><td>20</td><td>58</td><td>38</td></tr>
<tr><td>4</td><td>19</td><td>39</td><td>20</td></tr>
<tr><td>5</td><td>17</td><td>59</td><td>42</td></tr>
<tr><td rowspan="6">2. Solve, using numerical analysis, mathematical problems that involve uniformly accelerated motion.</td><td>6</td><td>43</td><td>54</td><td>11</td><td rowspan="6">10. A car travelling at 25.3 m/s approaches to stop for a restaurant ahead. If the driver slams on the brakes with an acceleration of -6.40 m/s^2, what will be his stopping distance?
A. 14.0 m B. 29.0 m C. 50.0 m D. 100.0 m

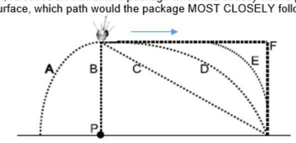
11. Rank the following objects according to the magnitude of the acceleration, from LEAST to GREATEST.
1. a car accelerating from 20 m/s to rest in 1.0 s.
2. a jogger accelerating from 2.0 m/s to 1.0 m/s in 8.3 s.
3. a falling fruit accelerating from 0.50 m/s to 10.3 m/s in 1.0 s.
4. while being hit, a golf ball accelerating from rest to 4.3 m/s in 0.40 s.

A. 1 – 3 – 2 – 4
B. 2 – 4 – 1 – 3
C. 1 – 4 – 3 – 2
D. 2 – 3 – 4 – 1</td></tr>
<tr><td>7</td><td>25</td><td>21</td><td>-4</td></tr>
<tr><td>8</td><td>28</td><td>16</td><td>-12</td></tr>
<tr><td>9</td><td>10</td><td>24</td><td>14</td></tr>
<tr><td>10</td><td>23</td><td>20</td><td>-3</td></tr>
<tr><td>11</td><td>21</td><td>36</td><td>15</td></tr>
<tr><td rowspan="4">3. Explain the conditions when a body is considered to be freely falling.</td><td>12</td><td>26</td><td>90</td><td>64</td><td rowspan="4">13. A piece of flat white paper is dropped and falls to the floor. The same piece of paper is then crumpled into a ball and dropped again. Which of the following will change in the second situation?
A. the weight of the paper
B. the initial acceleration when dropped
C. the time taken to reach terminal velocity
D. the maximum magnitude of the air resistance

14. Two stones of different weights were released at the same time from a table. What will happen and why? Air resistance may be ignored.
<table><tr><th></th><th>what will happen</th><th>why</th></tr><tr><td>A</td><td>both stones hit the floor at the same time</td><td>the acceleration of free fall is constant</td></tr><tr><td>B</td><td>both stones hit the floor at the same time</td><td>they fall at constant speed</td></tr><tr><td>C</td><td>the heavier stone hits the floor first</td><td>acceleration increases with weight</td></tr><tr><td>D</td><td>the heavier stone hits the floor first</td><td>speed increases with weight</td></tr></table></td></tr>
<tr><td>13</td><td>5</td><td>38</td><td>33</td></tr>
<tr><td>14</td><td>25</td><td>74</td><td>49</td></tr>
<tr><td>15</td><td>31</td><td>78</td><td>47</td></tr>
<tr><td rowspan="4">4. Solve, using numerical analysis, mathematical problems that involve free fall motion.</td><td>16</td><td>39</td><td>36</td><td>-3</td><td rowspan="4">18. A ball thrown vertically upward reaches a maximum height of 30 meters above the surface of Earth. At its maximum height, the speed of the ball is ______.
A. 0.0 m/s B. 3.1 m/s C. 9.8 m/s D. 24 m/s

19. A ball dropped from rest falls freely until it hits the ground with a speed of 20 meters per second. The time during which the ball is in free fall is approximately ______.
A. 0.5 s B. 1 s C. 2 s D. 10 s</td></tr>
<tr><td>17</td><td>25</td><td>30</td><td>5</td></tr>
<tr><td>18</td><td>39</td><td>64</td><td>25</td></tr>
<tr><td>19</td><td>44</td><td>61</td><td>17</td></tr>
</table>

<table>
<tr><td>5.</td><td rowspan="5">Describe the horizontal and vertical motions of a projectile.</td><td>20</td><td>20</td><td>28</td><td>8</td><td rowspan="5">23. Four identical projectiles are launched with the same initial speed, v, but at various angles above the level ground. Which diagram represents the initial velocity of the projectile that will have the LARGEST total horizontal displacement? Neglect air resistance.


24. A NASA probe moving horizontally above the moon's surface at constant speed, as shown in the diagram, releases an instrument package when it is directly above point P. As seen from the lunar surface, which path would the package MOST CLOSELY follow after release?

</td></tr>
<tr><td></td><td>21</td><td>39</td><td>54</td><td>15</td></tr>
<tr><td></td><td>22</td><td>11</td><td>3</td><td>-8</td></tr>
<tr><td></td><td>23</td><td>19</td><td>78</td><td>59</td></tr>
<tr><td></td><td>24</td><td>22</td><td>46</td><td>24</td></tr>
<tr><td>6.</td><td rowspan="6">Investigate the relationship between the angle of release and the height and range of the projectile.</td><td>25</td><td>4</td><td>24</td><td>20</td><td rowspan="6">For questions 29 and 30 refer to the information below.
Projectile A is launched horizontally at a speed of 20 meters per second from the top of a cliff and strikes a level surface below, 3.0 seconds later. Projectile B is launched horizontally from the same location at a speed of 30 meters per second.
29. Approximately how high is the cliff?
A. 29 m B. 44 m C. 60 m D. 104 m
30. The time it takes projectile B to reach the level surface is ______.
A. 2.0 s B. 3.0 s C. 4.5 s D. 10 s</td></tr>
<tr><td></td><td>26</td><td>28</td><td>34</td><td>6</td></tr>
<tr><td></td><td>27</td><td>40</td><td>26</td><td>-14</td></tr>
<tr><td></td><td>28</td><td>8</td><td>13</td><td>5</td></tr>
<tr><td></td><td>29</td><td>49</td><td>53</td><td>4</td></tr>
<tr><td></td><td>30</td><td>29</td><td>39</td><td>10</td></tr>
</table>

Based on the table, the five (5) items which garnered significant increase in posttest are item numbers 5, 12, 14, 15 and 23. Item number 12 obtained the highest increase in score, from 26 it has improved to 90. The pretest score indicated that the research respondents had a misconception on the acceleration of objects of different masses, and the increase in score indicated that this was corrected. Item number 23 also displayed a significant increase in posttest score as this item targeted the research respondents' skill in recalling the relationship of launching angle to its travelled range. As gleaned from the table, all questions involving recall and situational analysis obtained significant increase in scores; hence, improved performance. On the other hand, item numbers 7,8,10,16,22 and 27, which all required to solve problems, obtained negative values in the difference which means that the research respondents got a lower score in the posttest. Item number 27 acquired a negative value of 14 which means that a number of students got confused with this item. Table 27 clearly shows that the research respondents had a relatively low improvement on items involving problem solving across all focus topics.

Effectiveness of using Gooru LMS in an FC on Students' Learning Experiences

In relation to the students' learning experiences on the use of technology as part of classroom learning activities, a reflective journal was utilized in this study. The students were asked to answer one (1) reflective journal every after each focus topic. It has explored three (3) areas of the research respondents' perception regarding the use of GLMS in a flipped classroom in terms of (1) physics achievement; (2) independent study skills; and (3) attitudes on the use of technology. Specifically, the research respondents reflected on how did the use of GLMS: (1) helped them understand the lessons, (2) encouraged them to work independently outside the classroom, and (3) made them engaged and interested in the topics. The following tables show the summary of the students' responses from the three (3) reflective journals and post individual interviews through the use of thematic analysis. Only the prevailing response of each student per question was considered to get the common theme.

Learning Experiences: Physics Achievement

Table 28 displays the common themes from the students' responses on how the use of GLMS helped them understand physics lessons.

Table 28

Summary of Journal Responses for Physics Achievement

Common Themes	Description	Frequency	%
Helpful in understanding the topic	functional tool for learning	97	95.10
No response	no answers given	3	2.94
Self-paced	designed to be accomplished at the student's own speed	1	0.98
Detailed and specific explanations	complete content	1	0.98
Technical difficulties	malfunctioning of Gooru features	36	35.30

Generally, the research respondents perceived the use of GLMS as very helpful in understanding the topics as evidenced by the obtained percentage of 95.10%. This finding was supported by the t-test results that pertain to the gain of mean score, which is statistically significant. Positive responses from 97 research respondents include common comments such as “helped me understand the lesson more because I can always go back and watch the Playlists” or “the videos and interactive sites clearly explains the topics.” Along with these common responses, some students gave some useful explanation as gleaned from the examples below:

Student 21: “The Gooru playlist helped me understand the lesson on free fall since the person in the video was able to present examples and situations and explain them thoroughly.”

Student 30: “The videos were very informative and I really understood the lesson presented. This helped me because I got to learn at my own pace and I knew that I had to stay attentive because I needed to answer the questions at the end.”

Student 61: "It helped me learn about the misconceptions of Free Fall, which used to be my thoughts or what I know about that topic."

Student 39: "It helped me understand projectile motion because of the different given examples and the method of teaching in the videos. It helped me because it showed illustrations and explained it at the same time (visual and auditory). "

Student 62: "It helped me understand how to apply projectile motion in real life and it also helped me understand the concepts and conditions to say whether or not it's a projectile motion and if it is it helped me solve and figure out the variables of it."

Student 93: "It helped because it was so much easier to browse the lessons at home. It is also organized in a way where we can have an easier time looking for a particular topic."

In support of these claims, several studies (Kabassi et al., 2016); (Park, 2009); (Griffith & Liyanage, 2008); (Kabassi, K. et al., 2016); (Papazoglou et al.,2005); (Tsiakas et al., 2005); (Vassilakis et al., 2006); (Sahrir et al., 2016); (Lonn, 2009); (Papastergiou, 2006); (Emelyanova & Voronina, 2014); (Lonn, 2009); (Psycharis et al., 2013); (Chowdhry et al., 2014); (Sengel, 2014) had proven that the use of any e-platform or Learning Management System is effective which enables the learners to create an ideal learning environment to interact with the content, instructor and other learners; therefore, using GLMS in a flipped classroom produces positive effect in their performance.

Although majority of the participants had a positive response about the use of GLMS in their physics performance, some gave negative comments on its technicalities, which is expected since the platform is free and internet-dependent. Examples were:

> *Student 4: "It slightly did because in the times that I could access it, it helped me very much but I always have a lot of difficulty accessing Gooru at home. It helped me with the concepts due to the videos given as well as the activities. It also has taught me independence and I was able to study at my pace while doing other activities as well."*

> *Student 98: "It does help but sometimes Gooru is crashed, updating and alike. However, it also helps me to understand because there's exercise, videos, and also you can interact with others."*

> *Student 80: "It was just okay but sometimes the site crashes."*

> *Student 41: "Sometimes the website will crash or lag."*

> *Student 27: "It didn't really help me, because there are times when it doesn't work."*

The researcher expected such responses since at the time of the implementation the Gooru company had an update of its software; hence, there were problems encountered as regards to the original contents and format of the prepared playlists. Also, stability of the internet connection at home played a role in this concern. The researcher learned that some of the research respondents had accessed the playlists in school, since the internet connection is very stable and suits the required speed for the Gooru LMS.

Learning Experiences: Independent Study Skills

The next table presents the summary of the students' responses on the area of independent study skills.

Table 29

Summary of Journal Responses for Independent Study Skills

Common Themes	Description	Frequency	%
Independent learner	personal effort to learn concepts	47	46.08
Time management	manages time wisely	25	24.51
No response	no answers given	16	15.69
Sense of responsibility	responsible navigation of the prepared Playlists	9	8.82
Develop initiative	personal decision on when and where to study	4	3.92
Develop research skills	personal decision to search other supplemental materials	1	0.98
Preference for person-teacher	needs teacher's assistance and face-to-face interaction with classmates	21	20.59

It can be concluded from the table that students found the use of GLMS to be helpful in order for them to become independent learners, as reflected by a percentage score of 46.08. Common responses include: "the use of Gooru Learning encourages me to think on my own even more and do things independently," "I don't have to rely on my teacher that much" and "a good learning environment outside the classroom" to elaborate more of this theme, excerpts from the students were presented as follows:

Student 1: "Gooru encourages me in studying because sometimes I can't keep up in class so it's nice to work and study independently at home."

Student 14: "Because it makes me more independent and it encourages me to do my work so I don't get left behind. I have developed how to become more independent by using Gooru I also learned Ned how to solve and what free fall motion it because of Gooru."

Student 31: "I have learned how to manage my study time at home, how to remind myself to study, and how to make learning at home a priority."

Student 32: "I get to study at my own pace and in my own space, and I get more independent because when I don't understand something I research and I don't depend on my classmates and teacher. I developed being independent because sometimes we can take advantage of being able to learn at home and we get distracted but I focused and studied the playlist and didn't forget to navigate through the playlist."

Student 92: "Because when we are at home we need to have the initiative to check the Gooru to make sure we are up to date with all the lessons. Independent learning."

Parallel results were also observed on the works of various research studies (Knabe, 2004); (Nam and Smith-Jackson, 2007); (Field et al., 2014); (Anand, 2015), which concluded that online learning environment is examined to be useful and effective to inculcate quality learning independently.

On the other hand, in a study conducted by Saunders and Pincas (2004), the authors found out that although a number of research respondents indicated that they favor more interactive forms of teaching, the need to have more time for independent study combined with face-to-face classes will enable them to learn and reflect more of their performance. In addition, the need to include the teacher's involvement is of great importance to clarify unclear concepts and to have an opportunity to ask and interact with the teacher (Garber's review, 2004; Bonk & Reynolds, 1997; and Rossett, 2002). Below are some sample responses that show the need to include synthesis session every after navigating a playlist:

> *Student 21: "Not really helpful because it is better when it is discussed in class and with the teacher."*

> *Student 39: "It helps in making us independent self-learners. We get to learn by ourselves, but with the guidance of a teacher who clears the messy and confusing concepts for us. It's great that the teacher teaches and makes it clearer even after we watched the playlist. I learned how to manage time, be independent, and learn by myself."*

> *Student 34: "I find it easier to have class discussions because the teacher gives more insight on the topic and you can ask questions."*

Student 25: "I am not good at controlling myself or disciplining self to strictly study at home that is why I like one on one discussions with the teacher."

Student 89: "I still prefer the classroom environment where I can exchange ideas with the teacher and fellow students."

Following the first theme, a total percentage of 24.51% of the participants answered "time management" and 8.82% answered "sense of responsibility." Students developed to manage their time wisely and to be responsible, since Gooru playlists were given as homework following the flipped classroom model. This entails effort on the part of the students to decide on themselves on when to study the playlists, provided that they have navigated the given tasks before the next meeting. Sample response were:

Student 4: "I am able to manage my time in studying and homework and it made me more responsible of the things that I need to do."

Student 15: "It encourages me because I can study when I'm in my "zone". I have learned time management and discipline."

Student 59: "It gives me a sense of responsibility and to accomplish the tasks given. Time management to set aside time for my homework and etc."

Student 53: "It helps us be more independent and responsible, considering we have to watch the videos and check regularly for updates."

Student 95: "It gives us a sense of responsibility of really doing our homework because of the consequence of being lost in classroom discussion. I have developed the skill of being more responsible and independent."

Student 100: "While being able to study at my own pace, I am learning how to be more responsible, independent, as well as learning how to research or check other sources for more information about the lesson for a deeper understanding."

Student 4: "It helps me learn from my mistakes and I learned to always check all sites and I have learned to be more responsible since we have it almost every day and it is like attending a lesson at any time I want to."

The responses in the reflective journals are similar to the results obtained by Khan (2011), Emelyanova & Voronina, (2014) and Md Noh et al (2015) from their research studies. Based on the related studies, students perceived flipped classroom model to give many advantages as to how they manage their time and being responsible in their own learning. Based on the analytics from the Gooru dashboard, low performing students prefer to spend longer time on a prepared 20-minute designed playlist. It is assumed that students tend to go back and review Gooru resources. On the other hand, high performing students tend to spend a relatively shorter time on the same set of resources. In the duration of the study, a consistent

95% completion from the research respondents is expected from each Gooru playlist given, which is a clear indication that students were responsible enough to complete the assigned homework.

Moreover, a couple of responses on developing research skills and initiative also appeared from their reflections. Some sample responses are given below:

> *Student 16: "It inspired me to research on my topics beforehand for more understanding/background on the lesson. I was able to develop skills such as diligence and studiousness."*

> *Student 33: "I think this is because I am surrounded by myself and if I need help I could do some research and that helps me be more independent."*

> *Student 54: "It helped me work independently and it helped me develop researching skills in a way since if I had any questions or if I was curious about the topic, I would research more."*

> *Student 100: "While being able to study at my own pace, I am learning how to be more responsible, independent, as well as learning how to research or check other sources for more information about the lesson for a deeper understanding."*

Overall, writing reflective journals greatly help students in assessing individual self for direction and in acquiring independent study skills and positive attitudes toward learning experiences in and outside the classroom (Derntl and Mazzurana, 2010); (Meyer et al., 2008); (Paris & Paris, 2001); (Field et al., 2014); (Anand, 2015); (Nguyen & Ikeda, 2015); (Donnell et al., 2011); (Pardamean et al., 2013); (Alharbi & Drew, 2014). The common themes observed are indicators that students have developed independent study skills in using GLMS in a flipped classroom. They have learned to become more responsible for learning, in managing their own time and in having the initiative of looking for other resources online.

Learning Experiences: Attitudes on the Use of Technology

Table 30 displays the summary of the responses in their learning experiences as to how the use of GLMS made them engaged and interested in the topics.

Table 30

Summary of Journal Responses for Attitudes on the Use of Technology

Common Themes	Description	Frequency	%
Useful	efficient tool to learn Physics concepts	78	76.47
Interesting/engaging	appropriate to student's maturity and abilities	10	9.80
Technical difficulties	malfunctioning of Gooru features	11	10.78
Preference for person-teacher	needs teacher's assistance and face-to-face interaction with classmates	3	2.94

Majority of the participants (76.47%) expressed how they find the GLMS to be very useful in their studies, which is very much consistent to the findings of Alharbi and Drew (2014). The results indicated that when users perceived ease of use increases, the perceived usefulness increases accordingly. As expected, when academics distinguished LMS as easy to use, they developed a positive attitude towards utilizing it, which is consistent with the results of the other tables. In addition, the perceived usefulness increased the degree of positivity toward usage, which subsequently affected the behavioral intention to use. In support of the claims, here are some of the responses:

Student 69: "I really think the Gooru Learning is useful in studying Physics because it can be used as a powerful tool by students in making us more engaged and interested in the topic. It makes us more interested because some of us aren't really contented with just learning inside the classroom since one (1) hour isn't enough to give the students all the visuals to learn a particular topic. I think that with the use of Gooru Learning, we don't just listen to the things our teachers say but we also learn by ourselves and then that is the right time our teacher will give a recap or elaborate the lesson in class."

Student 13: "Great because I get to study the topic and browse through the playlist at the time I'm more comfortable with so I really get to understand and enjoy the topic."

Student 24: "I think Gooru is useful in studying Physics since we are able to learn at home and then have more time, to test out what we have learned, in school."

Student 28: "Gooru Learning's best feature is that the students can visit the Playlist in the comfort of their home and in their suitable conditions. Gooru helped me get more into physics, because I was understanding the lesson more. I learned better because I could choose the time I wanted to study it, where I will study it, how fast or how slow I am going to read about the topic."

Student 35: "I believe it is useful in studying Physics, it also made me more engaged and interested in the topic because there were different ways on how the concepts were introduced."

Student 39: "It's helpful because we are able to have our own understanding, not entirely depending on the teacher's explanation. It made the topic more interesting because the different videos engaged us to learn and know more about the lesson."

Student 36: "It made me more engaged and interested in the topic by presenting the concepts in a different way. It also allowed me to be able to study it at my pace which was very helpful especially if we have lots of things to do."

Similar to the studies of Papazoglou et al. (2005) and Spathopoulos (2007), they have concluded that students felt that the teaching quality has been made better and online supplements had significantly lessened the time allotted in administering and supervising the subjects taught. In line with this, students got more engaged and interested in the topics as shown in the following statements:

Student 3: "Gooru makes me more interested because it makes me learn at my own pace and if I miss out on something I can just go back."

Student 19: "It is useful because we lack time, so we are given this so we can learn even when we are at home. It got me more interested in the topic because it seems like a fun lesson."

Student 35: "It made me engaged and interested in the topic because I was able to clearly see its relevance in real life and how all the concepts work individually and as one whole."

Student 42: "The topics were interesting because it was presented in an organized manner."

Student 69: "Gooru Learning is useful in studying Physics because we get to navigate the videos and learn concepts even if the teacher is not around. The use of Gooru made me more engaged and interested in the topic because it allows me to learn the topics in a different approach."

Student 82: "It actually shows you videos which the creators have made to look far more interesting than the topic should be. Gooru did make more engaged at the topic too because of the different and unique way it was taught."

On the other hand, there were some participants who perceived the utilization of GLMS useful but not completely engaging and interesting without face-to-face meetings. Consistent with the previous tables, the need of the presence of the teachers clearly stresses the importance of holding synthesis periods every after playlist. The following are some sample answers:

Student 5: "I think it is useful since it makes us learn both at home and school but the interest when it comes to Gooru is not that high compared to class because when it comes to classes there is recitation and collaboration."

Student 6: "Gooru is useful in studying Physics, however, in terms of being able to fully understand the lesson, I would need the help and guidance of a teacher. It did make me more interested in the topic (because of the videos)."

Student 7: "I want to interact more with someone (my classmates/teacher) not just my computer or my MLD so I can understand the topic and cooperate more."

Student 24: "I believe Sir Magalong could teach better in front of us than the Gooru learning. It made me more interested however I had a hard time full understanding the concepts."

Student 63: "Yes, it is considered helpful in studying Physics; The use of technology as a medium in learning this branch of science engaged me to learn more since it includes interactive methods, such as videos and online questions. On the other hand, just using Gooru may still be incomplete in learning this subject since we also need to learn through experience, hence the traditional class learning and laboratory experiments."

Student 6: "Yes, I do think that Gooru Learning is useful, however it is only to deepen our knowledge about the topics being discussed. It is still preferable for me to have the topics discussed thoroughly by the teacher. It got me engaged in the lessons because sometimes, what's on the playlist is more interesting than what is taught in a normal classroom."

The results clearly revealed that the use of an LMS in a flipped classroom has gained positive attitudes from the research respondents. The outcomes are consistent to the theoretical framework used in this study as students became responsible in "constructing" their own learning as revealed by the common themes appeared in their responses. Moreover, it may be concluded that learning actively takes place as the environment becomes more student-centered with emphasis on active learning through collaboration and social construction of understanding. Majority of the students mentioned that they were helped by GLMS to understand the focus topics, since they can study at their own pace, anytime, anywhere. This requires managing their time wisely and become responsible in the tasks given at hand. On the other hand, negative responses emerged from their journal responses particularly on the technical aspects of the LMS and the need to collaborate with their teachers and classmates. Such comments were expected since only limited features of the GLMS were used due to software updating. Although there were students who had negative responses on this classroom model, still they are considering this set up provided that there will be face-to-face collaboration with the teacher the next meeting.

Implications of the Study

This study was done to further discover the practical implementation of using an LMS in a flipped classroom, especially in measuring the effectiveness of using Gooru in elevating students' understanding in kinematics and in determining students' learning experiences on the use of technology. The result of this study has proven that the application of constructivism and connectivism learning theories to the development of learning materials using an LMS in a flipped classroom has important implications for physics education research.

The most important implication of this research is that the use of Gooru LMS in a flipped classroom model has the potential to help the 21st century learners to learn better while targeting the set of skills they are expected to have. The results further support the development of lifelong learning skills included in the 21st century learning framework such as having mastery of the fundamental subjects, becoming critical thinkers and problem solvers, being able to communicate and collaborate, having the initiative and self-direction, and becoming ICT literates. Development of the mentioned skills were evidenced by the result of the t-test comparing the mean gain scores from their pretest indicating the significant increase in their physics achievement. This means that the developed instructional materials using flipped based instruction could be an appropriate format in designing lesson procedures for other physics topics or subject areas. Based on the positive results, this method may be considered as a new innovative approach in teaching physics as such poses an alternative effective method of presenting kinematics concepts considering the type of learners we have today. This study has provided an empirical measurement, which proved that carefully designed flipped classroom activities together with teacher's involvement have the potential and capability of increasing students' understanding. It can be safely assumed that if the same classroom model is used with other topics, satisfactory results may be expected.

The presented implication was further strengthened by their positive responses in their reflective journals and post individual interviews. Common themes from their journals and interviews revealed that majority of the research respondents find the use of GLMS to be effective in delivering physics concepts and in improving their learning experiences in terms of independent study skills and attitudes on the use of technology. Research respondents become responsible in their own learning in terms of managing time on when to navigate the playlists before coming to the class and having the initiative to research on other related resources regarding the topic. Additionally, responses indicated that the students had perceived ease on using the LMS, which developed positive attitudes toward utilizing it and subsequently affected the behavioral intention to use it in other physics topics and subject areas. Positive feedback will inspire educators to implement the same method using other LMSs and encourage students to use technology as a helpful tool in the teaching and learning process, especially when there are school activities, class suspensions, and those who were absent for a long time.

Although it was observed that using GLMS in a flipped classroom can help students to learn, preparation and development of learning plans following a blended learning instruction takes a lot of time and technical expertise. It was realized that activities at home and in classroom must be properly designed to avoid redundancy of activities prepared. It is important to take note that when a teacher plans to use any LMS in a flipped classroom, proper introduction to the model is essential to the success of students' achievement. It was observed by the researcher that the students find the flipped classroom model to be unfamiliar since it is still unpopular here in the Philippines. This study realized the importance of holding a synthesis session every after each playlist; hence, the presence and expertise of a teacher to clarify unclear parts of the lesson can be effectively addressed inside the classroom. Prior to the studied topics in kinematics, the researcher practiced this classroom model from previous lessons so that the students can be comfortable and get used with the format and in navigating Gooru playlists. A stable internet connection plays an important role to implement this method properly. Based on the responses, some students encountered technical problems, which can be attributed to their connection and LMS updating.

In conclusion, it is always important to take into consideration the appropriate pedagogy that must be properly aligned with the day's learning objectives. 21st Century Learners, Millennials or Digital Natives - - - these are the kinds of learners we have today. They were born in an information society that is why teachers need to be prepared as well. Although the current set of educators was taught differently years back, teachers must be "innovative" in order to address the needs and demands of the learners. Data gathered will serve as basis for possible implementation to other piloting schools, enabling the academe to understand more the learning profiles of the Millennials. Results of this study have provided evidences to improve more on the craft and be updated to the latest trends of technology use; therefore, appropriateness and relevance of the technology use will be fully realized by the 21^{st} Century Learners.

CHAPTER 5

SUMMARY of FINDINGS, CONCLUSIONS and RECOMMENDATIONS

This chapter presents the summary of the results of the study, which covers the summary of findings, conclusions and recommendation for future studies.

Summary of Findings

The following are the outlined results of this study with regard to the use of Gooru Learning Management System in a flipped classroom and its effects on students' physics achievement and learning experiences:

Validation of Research Instruments

Preliminary analysis of data includes the validation process of the developed learning plans using GLMS in a flipped classroom, teacher-made achievement test and reflective journal template. This was accomplished by determining the level of acceptability as well as calculating the Cronbach alpha values to determine the inter rater agreement.

For the learning plans, results showed that the overall assessment of the Physics experts in all areas using a checklist questionnaire has a mean of 4.65 which is interpreted as "Very Acceptable". It means that the validators accepted the learning plans as suitable tools that consisted of important elements to be observed in carrying out lessons in a flipped classroom model using GLMS. The validity was further strengthened by obtaining an overall Cronbach alpha value of 0.84 which is rated as “Good” and clearly indicated that the learning plans were ready for implementation inside the classroom.

For the teacher-made achievement test, the results showed that the overall assessment of the Physics experts in all areas of the achievement test using a checklist questionnaire has a mean of 4.91 which is interpreted as “Very Acceptable”. It means that the validators accepted the developed instrument as an appropriate tool to determine students’ Physics achievement in terms of the questions included, options presented, language used and the structured layout. In addition, the material obtained a Cronbach value of 0.84, which is interpreted as “Good”. This indicates that the developed achievement test was cohesively approved for implementation in the classroom as an appropriate tool for pretest and posttest.

Lastly, the reflective journal template obtained a mean of 4.73, which is interpreted as “Very Acceptable.” The validators considered the material to be useful in terms of probing students’ learning experiences in terms of independent study skills and attitudes on the use of technology. The mean value evidently shows that the prepared reflective journal template both for individual and post-interviews were suitable tools for this study. Also, validators had a consistent evaluation of the reflective journal instrument as reflected by the Cronbach alpha value of 0.85, which is interpreted as “Good”.

<u>Pretest comparison among the focus topics</u>

The group had almost the same pretest mean scores on all focus topics. Specifically, the research respondents obtained the following pretest scores of 2.500, 2.294 and 2.637 for horizontal, vertical, and projectile motion topics respectively. The computed overall pretest mean score is 7.431, which suggests that none of the topics have been clear prior to the implementation of the study. Hence, pre-test scores for beginning physics students were relatively limited, low and unsatisfactory.

Posttest comparison among the focus topics

An increase in the posttest mean scores was attained as shown in the obtained values of 3.931, 4.578, and 3.873 respectively. The vertical motion topic attained the highest mean score which means that the utilization of GLMS was found to be most effective in this area. Overall, a posttest mean score of 12.382 implied that there was an improvement in their performance which can be attributed to the method employed in this study.

Significant differences of the pretest and posttest mean scores among the focus topics

By utilizing the t-test for paired samples, the researcher was able to determine that there was a significant difference between the pretest and posttest scores of the group on all focus topics. The obtained p-value of .000 is less than 0.05 alpha level of significance and the computed t-values of 6.145, 12.710, and 5.651, which are greater than the tabular t-value of 1.984. Consistent with the previous interpretations, the vertical motion has gained the highest score in which the researcher may conclude to be related to the research respondents' mastery of horizontal motion. Essentially, the vertical and horizontal motions are closely related in terms of concepts and mathematical definition. It is also notable that the projectile motion topic got the lowest gain in scores which may be attributed to its complexity, as this required the research respondents to recall bodies moving at a constant velocity and uniform acceleration.

Overall significant difference of the pretest and posttest mean scores

Overall, the utilization of GLMS in a flipped classroom is claimed to be a potential method in increasing students' learning as indicated in the obtained t-value of 11.796 which is greater than the tabular t-value of 1.984 and a p-value of .000 which is less than 0.05 alpha level of significance. The improvement on the group was attributed from the nature and perception of students who have utilized the same method based on evidences found in literatures (Day & Foley, 2006); (Zappe et al., 2009); (Moravec et al., 2010); (Missildine et al., 2013); (Tune et al., 2013); (McLaughlin et al., 2014); (Mortensen et al. 2015), which have supported the effectiveness of using a Learning Management System in a flipped classroom model.

Significant Increase on Students' Physics Achievement between the Pretest and Posttest

Item no. 12 obtained the highest increase in score, from 26 it has improved to 90. The pretest score indicated that the research respondents had a misconception on the acceleration of objects of different masses, and the increase in score indicated that this was corrected. It was observed that all questions involving recall and situational analysis obtained significant increase in scores; hence, improved performance. Item no. 27 acquired a negative value of 14 which means that a number of students got confused with this item. Data clearly shows that the research respondents had a relatively low improvement on items involving problem solving across all focus topics.

Learning Experiences: Physics Achievement

The reflective journal regarding their perception on how the use of GLMS assisted them in Physics, presented that 95.10% of the participants have positive perception that using it is very helpful in understanding the topic. This is further supported by the significant gains in their mean scores. Although majority of the participants had a positive response about the use of GLMS in their physics performance, some gave negative comments on its technicalities, which is expected since the platform is free and internet-dependent. Roughly 2% responded that it helped them to learn in their own pace and remarked playlists as detailed in explanations.

Learning Experiences: Independent Study Skills

On the area of independent study skills, 46.08% responded that the use of GLMS helped them to become independent learners, as it provides a good learning environment outside the classroom which in turn encourages them to think on their own more and do things independently. These claims were also supported on the works of various research studies (Reushle & McDonald, 2000); (Knabe, 2004); (Nam and Smith-Jackson, 2007); (Field et al., 2014); (Anand, 2015), which concluded that online learning environment is examined to be useful and effective to inculcate quality learning independently. Along this theme, 25% of the students responded that the use of GLMS helped them to manage their time wisely and 8.82% responded that they learned the value of becoming responsible in their own learning. Gooru playlists were given as homework, which entails effort on the part of the students to decide for themselves on when to study the playlists, provided that they have accomplished the given tasks before the next meeting. In addition, roughly 4% responded that they have developed the initiative to research online resources if they have questions in mind after navigating the playlists.

Learning Experiences: Attitudes on the Use of Technology

Lastly, with regard to the students' attitudes on the use of technology, 76.47% of the research respondents perceived the usefulness of GLMS, hence increasing the degree of positivity toward usage, which in turn subsequently affected the behavioral intention to use it. Moreover, 9.80% of the research respondents find the use of GLMS to be interesting and engaging, which have made teaching quality to become better since online supplements lessened the time for supervising and administering subjects taught (Papazoglou et al., 2005). On the other hand, some participants prefer to still hold face-to-face meetings in conjunction with the use of LMS in a flipped classroom. Therefore, the need to hold synthesis sessions with the teacher plays an important role to make this classroom model effective.

Conclusions

This study aims to determine the effectiveness of using Gooru Learning Management System in a flipped classroom on the students' Physics achievement and learning experiences based on the principles of constructivism and connectivism. Moreover, this research primarily aims to add to the limited research works on using LMS as a teaching pedagogy and in understanding more of our students' learning experiences in terms of independent study skills and attitudes on the use of it.

In line with the findings of the study, the researchers arrived at the following conclusions:

1. The computed overall pretest mean score is 7.431, which suggests that none of the topics have been clear prior to the implementation of the study. Hence, it is concluded that pretest scores for beginning physics students were relatively limited, low and unsatisfactory. Overall, a posttest mean score of 12.382 implied that there was an improvement in their performance which can be attributed to the method employed in this study.
2. There was a significant difference between the pretest and posttest scores of the group on all focus topics. The obtained p-value of .000 is less than 0.05 alpha level significance and the computed t-values of 6.145, 12.710, and 5.651 for all focus topics and an overall t-value of 11.796 which are greater than the tabular t-value of 1.984.
3. The journal responses clearly revealed their positive attitude toward the use of GLMS in a flipped classroom. Moreover, they have reflected that using GLMS is very useful for them to learn independently, to manage their time wisely and to be responsible in their own learning. In addition, although majority accepted the use of such method, the responses expressed the important role a teacher plays in the learning process, which can be addressed by holding a synthesis session every after a flipped based instruction.

Recommendations

Finally, in the course of this study of measuring the effectiveness of using GLMS in a flipped classroom on students' achievement and learning experiences, further potential investigations arose in the mind of the researcher that can be regarded as prospective research undertakings. Based on the conclusions of the study, the following are recommended:

1. Conduct further studies in other physics topics. Since Gooru is a free LMS, it is possible to develop flipped based instructions that will enable students to demonstrate the ability to analyze and synthesize physics concepts, and use a standardized test to analyze pretest and posttest data;
2. Conduct a longitudinal study to confirm if the use of GLMS in a flipped classroom indeed promotes change in conceptual understanding and learning experiences on the use of technology;
3. Conduct further studies on the students' learning experiences on the use of a flipped classroom model in different subject areas;
4. Conduct further studies on using a different Learning Management System which is more stable, student and teacher-friendly and has minimal technical issues;
5. Conduct further studies on the effectiveness of using an LMS in a flipped classroom model for students who are out for a long time such as athletes, students with medical condition, and for events such as class suspensions and interruptions due to school-sanctioned activities.

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APPENDICES

APPENDIX A

Checklist Questionnaire: Learning Plans

PERSONAL PROFILE FORM

Direction: Please fill in the necessary information asked in the questionnaire by supplying data or by checking the item in the space provided for each item.

Name: ______________________________ Gender: _________________
Present Position/ Rank: _________________ Years of Teaching Experience: _____
School/ University: _________________ Subject/s Taught: _________________

Highest Educational Attainment:
_________________ Doctorate Degree
_________________ Master's Degree with PhD Units
_________________ Master's Degree
_________________ Bachelor's Degree with MA units
_________________ Bachelor's Degree

Specialization: _________________ Other Expertise: _________________

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Validation Tool for the NxGBL Learning Plans

Direction: Please put a check mark on your assessment on the learning module developed by the researcher using the Next Generation Blended Learning (NxGBL) Format with the assessments. This learning module will be implemented to Grade 10 students.

Please assess using the following scales with corresponding interpretation and descriptions

SCALE	INTERPRETATION	DESCRIPTION
5	Very Acceptable	*The statement is highly evident in the learning module.*
4	Acceptable	*The statement is evident in the learning module.*
3	Moderately Acceptable	*The statement is somehow evident in the learning module.*
2	Least Acceptable	*The statement is not that evident in the learning module.*
1	Not Acceptable	*The statement is really not evident in the learning module.*

A. The **OVERALL PLAN**:	**5**	**4**	**3**	**2**	**1**
1. is written in a clear and understandable manner.					
2. can be carried out in an actual school situation.					
3. is geared to the level of the students' maturity and abilities.					
4. includes the use of supportive or illustrative audio or visual aids.					
5. contains the necessary parts of a learning plan of a flipped based instruction.					

B. The **CONTENT:**	**5**	**4**	**3**	**2**	**1**
1. is sufficient and appropriate to the level of the students' maturity and abilities.					
2. is properly aligned to the learning competencies intended for the students' grade level.					
2. includes information necessary for the achievement of the stated objectives.					
3. includes all the essential parts of a NxGBL learning module.					

C. The **OBJECTIVES**:	**5**	**4**	**3**	**2**	**1**
1. are stated to meet both the expected content and performance standards.					
2. are clear, concise, and easily understood					
3. are designed to support identified student "outcomes" for the entire physics subject as stated in the physics topic outline					
4. are appropriately aligned to the developed formative and summative assessments.					

D. The **LESSON PROCEDURE**:	**5**	**4**	**3**	**2**	**1**
1. provides teacher and students logical orientation of the flow of the topic presentation.					
2. emphasizes the active participation of students in the presentation of the lesson.					
3. indicates clearly activities to be done in class and at home					
4. explains the use of the Gooru Learning effectively in terms of methods, techniques, and learning experiences appropriate to the lesson objectives.					
5. follows the design features of a flipped based learning.					
6. provides students with opportunities to become actively engaged in the learning process.					
7. is designed to meet student needs, interests, and abilities through the use of Gooru learning.					

E. The **ASSESSMENT TOOLS**:	**5**	**4**	**3**	**2**	**1**
1. allows the students to draw conclusions consistent with the objectives of the lesson.					
2. allows students to actively participate in summarizing what they have learned.					
3. have varied designs/features to measure students' understanding.					
4. are appropriately aligned to the lesson objectives.					
5. are appropriate to the level of students' maturity and abilities.					

F. The **ACTIVITIES**:	**5**	**4**	**3**	**2**	**1**
1. are aligned with the stated objectives					
2. are properly designed to support the scaffolding/incremental process leading to the desired students' outcomes for the lesson					
3. are varied to address student differences.					
4. are suited to the students' learning habits in class or at home.					
5. follow the design features of a flipped based learning.					

G. The **LANGUAGE** used:	**5**	**4**	**3**	**2**	**1**
1. is easy to understand					
2. avoids too much technical terms					
3. is free of misspelled words					
4. is free of grammatical errors					
5. provides instructions that are easy to follow					

H. The **LAYOUT**:	**5**	**4**	**3**	**2**	**1**
1. has a clear instruction and appealing design					
2. uses illustrations that help students build and develop clear scientific conceptions					
3. uses illustrations that are creative and appealing to the respondents					
4. shows readability of text					
5. provides enough and appropriate space for the questions and options					

COMMENTS / SUGGESTIONS FOR THE IMPROVEMENT OF THE LEARNING MODULE:

RATER'S SIGNATURE over PRINTED NAME

APPENDIX B

Checklist Questionnaire: Achievement Test, Reflective Journal and Post Individual Questionnaire

PERSONAL PROFILE FORM

Direction: Please fill in the necessary information asked in the questionnaire by supplying data or by checking the item in the space provided for each item.

Name: ______________________________ Gender: _________________

Present Position/ Rank: _________________ Years of Teaching Experience: _____

School/ University: _________________ Subject/s Taught: _________________

Highest Educational Attainment:

_________________ Doctorate Degree

_________________ Master's Degree with PhD Units

_________________ Master's Degree

_________________ Bachelor's Degree with MA units

_________________ Bachelor's Degree

Specialization: _________________ Other Expertise: _________________

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Checklist Questionnaire for the Physics Achievement Test

Direction: Please put a check mark on your assessment on the level of acceptability of the test items based on the following criteria. This achievement test will be administered to Grade 10 students.

Please assess using the following scales with corresponding interpretation and descriptions

SCALE	INTERPRETATION	DESCRIPTION
5	Very Acceptable	*The statement is highly evident in the developed test items.*
4	Acceptable	*The statement is evident in the developed test items.*
3	Moderately Acceptable	*The statement is somehow evident in the developed test items.*
2	Least Acceptable	*The statement is not that evident in the developed test items.*
1	Not Acceptable	*The statement is really not evident in the developed test items.*

A. The **QUESTIONS/STEMS** of the developed-test:	**5**	**4**	**3**	**2**	**1**
1. are briefly and clearly stated					
2. are measureable and attainable					
3. are aligned to the set learning competencies in the TOS					
4. are aligned to the levels of the Bloom's Taxonomy revealed in the TOS (LOTS and HOTS)					
5. are substantial that contains facts to be recalled, table and diagram to be interpreted and problems to be solved.					

6. are helpful in developing better conceptual understanding in Physics					
7. are useful in eliciting common students' misconceptions					
8. are helpful in improving students' critical thinking skills					
9. are meaningful by itself and present a definite problem					

B. The **OPTIONS/ALTERNATIVES** of the developed-test:	**5**	**4**	**3**	**2**	**1**
1. are briefly and clearly stated					
2. are related and relevant to the questions					
3. contain only one best answer					
4. contain good numbers of distracters					
5. contain distracters that are plausible and attractive					
6. are arranged logically					
7. are grammatically aligned with the question					

C. The **LANGUAGE** used in the developed-test:	**5**	**4**	**3**	**2**	**1**
1. is easy to understand					
2. avoids too much technical terms					
3. is free of misspelled words					
4. is free from grammatical errors					
5. provides instructions that are easy to follow					

D. The **LAYOUT** of the developed-test:	**5**	**4**	**3**	**2**	**1**
1. has a clear instruction and appealing layout					
2. uses illustrations that help students build and develop clear scientific conceptions					
3. uses illustrations that are creative and appealing to the respondents					
4. shows readability of text					
5. provides enough and appropriate space for the questions and options					

COMMENTS / SUGGESTIONS FOR THE IMPROVEMENT OF THE ACHIEVEMENT TEST:

____

RATER'S SIGNATURE over PRINTED NAME

APPENDIX C

Learning Plan and Assessments on Horizontal Motion

LASALLIAN NxGEN BLENDED LEARNING MODULE		
Teachers: Ms. Leah L. Lecerio, Mr. Salvador John M. Magalong, Ms. Arizza Mae Y. Santos	Grade/Year Level: G10	Subject: Physics
Term: Term 1, Module 1.2	Unit Topic: Mechanics	Time Frame: 7 Days

GENERAL LEARNING OBJECTIVES

CONTENT STANDARDS	PERFORMANCE STANDARDS
The learner demonstrates understanding of the descriptions of motion in one dimension.	The students will conduct a forum on mitigation and disaster risk reduction.

LASALLIAN GUIDING PRINCIPLES

✓	LGP 1: Challenge learners to realize their full potential.
	LGP 2: Bring Christian perspectives to bear on human understanding, skills and values of the learners.
	LGP 3: Are dynamic and encourage differentiation, diversity and synergy amongst learners that are friendly, caring and respectful.
✓	LGP 4: Ensure that learners translate knowledge into something useful in actual practice for the betterment of society.
✓	LGP 5: Prepare learners to participate responsibly in the world of work, family, community, nation, and church.

STAGE 1: ESTABLISHING DESIRED RESULTS

TRANSFER GOALS:

Students will be able to independently use their learnings in demonstrating and explaining to his/her community how concepts of motion in one and two dimensions are used in government mandated traffic rules.

ENDURING UNDERSTANDING:
Students will understand that the foundational descriptions of motion serve as the basis for the government- mandated traffic rules that motorists and pedestrians need to follow.
ESSENTIAL QUESTIONS:
Students will find the answers to the following questions: 1. When is a body considered to be in motion? 2. How do the concepts of motion explain the traffic safety rules that we have in the country?
ACQUISITION GOALS **Knowledge:** Describe the motion of an accelerating body. **Process:** Analyze situations and relate variables involving bodies that are accelerating. Use the acceleration formula in solving for the variables: acceleration, initial velocity, and final velocity. Solve for a missing variable by deriving an appropriate equation from kinematics equations.

LEARNING EVALUATION
STAGE 2: DETERMINING VALID EVIDENCE / ASSESSMENT
PRODUCT OR PERFORMANCE SHOWING EVIDENCE OF UNDERSTANDING & TRANSFER
iBOOK ON ROAD SAFETY
GRASPS NARRATIVE OF TRANSFER TASK
Due to an increasing number of accidents in your community, your traffic management council hired you to create an interactive iBook that will raise the youth's understanding and awareness of the dangers of not following government-mandated traffic safety rules and make them abide by these rules. You are to assume the role of: an info-campaign strategist who wishes to raise his constituents' awareness and understanding of the dangers of deliberately disobeying road rules. You are to share this iBook presentation to the young people in a chosen community and to the school's Junior HS students. The challenge also includes making the audience realize the importance of understanding road signs and following traffic safety rules imposed by your local officials, and the scientific bases of such traffic signs and rules. Your output will be assessed on content, visual appeal and assessment results. Your output in this task shall be used as the basis for your Term 1 Culminating Task on Planning an Organized Traffic Scheme: Metro Manila. Concepts and rules involved shall be implemented and reflected upon designing a scheme.

See attached rubric.
The following criteria are used in the rubric:

A. Content (50%)
   A.1 Subject Knowledge & Information
   A.2 Use of Accurate Motion Concepts
   A.3 Practicability of Content

B. Visual Appeal (20%)
   B.1 Pictures, Graphics, Slides Presentation
   B.2 Writing Mechanics (Grammar & Spelling)

C. Delivery (30%)
   C.1 Articulation
   C.2 Organization
   C.3 Interactiveness

Note: The PT in Unit 1 will be integrated to the PT of the next unit. An iBook presentation will be shared in the next unit involving the activities in the Newton's Olympics.

SCAFFOLD FOR TRANSFER			
LEVEL 1 Directed Prompt	LEVEL 2 Open Prompt	LEVEL 3 Guided Transfer	LEVEL 4 Independent Transfer
INTRODUCING DESCRIPTORS of MOTION CONCEPTS	IDENTIFYING PHYSICS CONCEPTS UNDERLYING ROAD AND TRAFFIC RULES	ATTENDING a SEMINAR on ROAD SAFETY	INFOMERCIAL PRESENTATIO N on ROAD SAFETY
The teacher will include situations involving incidents on roads when discussing the motion descriptors. Students are to identify how motion concepts are applicable in different situations.	The class will be divided into eight (8) groups. Students will research using their MLDs about governing rules on road and traffic in a particular area in Metro Manila. Students will identify five (5) mandated rules for motorists and will research on the scientific bases of these rules.	Students will be attending a seminar on road safety. They will learn how Physics concepts about motion are applicable in observing traffic, and the scientific bases of these government-mandated traffic safety rules. A synthesis material will be answered by the students to find the relation of the seminar information to the Physics concepts learned in class.	(please refer to GRASPS Narrative)

ASSESSMENT TOOLS (Unit Assessment Map)				
TYPE	KNOWLEDGE	PROCESS	UNDERSTANDING	PRODUCT/ PERFORMANCE
Pre-Assessment/ Diagnostic	Online Diagnostic (Pre-test)			
Formative	Map of Conceptual Change	Group Presentation Reflection Sharing Situation Analysis Problem Solving Laboratory Activities (Indoor and Field)	Real Life Applications Laboratory Activities (Indoor and Field)	Scaffold for Transfer
Summative	Short Assessments Post-test Laboratory Activities	Short Assessments Problem Solving Situation Analysis Map of Conceptual Change Laboratory Activities (Indoor and Field)	Map of Conceptual Change Short Assessments Laboratory Activities (Indoor and Field)	Infomercial Presentation on ROAD SAFETY
Self-Assessment		Reflection Journal	Reflection Journal	Portfolio

RELATED FACETS OF UNDERSTANDING
EXPLANATION: Students are to explain, in their laboratory reports and performance tasks, the importance of following government-mandated traffic safety rules. APPLICATION: Students are to identify the applications of the motion concepts in one dimension, particularly on observing road safety. SELF-KNOWLEDGE: Students are to independently use their learned concepts in showing his/her community how concepts of motion in one dimension are used in government mandated traffic rules. This includes road signs, local traffic safety rules, and their scientific bases.

BLENDED ACTIVITIES/TOOLS F2F and e-learning activities are aligned		
ENVIRONMENT ATTRIBUTES	FACE-TO-FACE	E-LEARNING
ACTIVE *Students investigate the Essential Question or a given situation, issue or problem. Students research in different sources and activities for information related to the EQ, situation or problem.*	oral recitation, class discussion, problem solving, games	pretest with the use of Google polls/surveys, Flipped Learning (Gooru Learning) • interactive activities • online games • virtual labs • simulation-based experiments
COLLABORATIVE *Students work in groups and discuss their ideas, answers, or solutions to EQ, problem or situation. Students take on roles to complete a group work.*	interview	station rotation (Gooru Learning), collaborative mobile apps
CONSTRUCTIVE *Students produce the content related to the knowledge and process competencies. Students form generalizations and conclusions based on different texts, situations, problems, and scenarios. Students answer the EQ and discuss the EU and justify their ideas with supporting examples.*	graphic organizers (illustrated or printed), oral recitation/defense, concept presentation, interview, discussion, socratic questioning, portfolio making	video streaming, assessments, reflective journals, slide presentations
AUTHENTIC *Students transfer their learning to real life situations. Students in their performance task show practical applications and solutions to the EQ, issue or problem situation. Students manifest the 7Cs of 21st century learning in their performance and product.*	portfolio	simulation-based experiments, photo editing, mixed/augmented realities, animations, interactive activities, virtual lab

GOAL-DIRECTED *Students reflect on their learning process. Students manage their way of working. Students check every now and then how they are accomplishing the learning goals they set for themselves.*	graphic organizer, mind maps	scoring rubrics, e-portfolio

LEARNING PROCEDURE

STAGE 3: LEARNING PLAN FLOW

LESSON PROPER

I. INTRODUCTION

Teacher introduces topic and asks Essential Question.
Students give their ideas or prior knowledge about the Essential Question in Map of Conceptual Change. Teacher may probe prior knowledge with diagnostic test or misconception check (e.g., with help of online survey). Teacher notes variety of ideas and motivates students to find out which ideas are correct. Students engage in Goal-Setting.

DAY 1 (Date: ___________)
Objective:

- Describe the motion of an accelerating body.

LEARNING ACTIVITIES in CLASS

Task 1 – Assessment No. 1.2.1 – Pre-Test in Kinematics (Google Forms) (Formative)
The teacher asks the students to answer a 30-item pre-test using a Google Forms for forty-five (45) minutes. The students respond to the survey. Real time responses may be shown to students for them to be aware of their prior knowledge on the topic as a class.

Task 2 – Gooru Learning Instructions
The teacher will instruct/review the students on the use of Gooru Learning. The teacher will make sure that students are enrolled to www.gooru.org using their DLSZ Google account and have the class code. Also, remind them that they are required to answer all exercises and jot down notes from the slides presentation. In addition, all handouts must be downloaded by pressing the printer symbol and choose "save as PDF". Students are required to make use of any PDF editing apps and outputs shall be sent via Google Classroom.

LEARNING ACTIVITIES at HOME

Gooru Playlist Tasks
Playlist Overview: In the Gooru interface, the students will be asked to answer the assessment to probe their initial understanding (pre-conceptions) about accelerating bodies. Outputs shall be submitted via Google Classroom. The students will again answer the assessment after the collection on accelerating bodies has been accomplished.

Tab 1 – Assessment No. 1.2.2 – Map of Conceptual Change (Anticipation – Reaction Guide) (Formative)
Narration: Before going through the Playlist, you need to accomplish first this form. Download it first, and make sure to follow all the instructions before submitting the file to Google Classroom. After submitting, you may proceed to the next part of the Playlist.

Tab 2 – Video Streaming (Acceleration Concepts)
Narration: Watch the next video to help you understand the concept of acceleration. Take note of the different conditions for a body to be considered accelerating. Enjoy! Video time: 00:00 - 02:32
Tab 3 – Video Streaming (Speed/velocity vs Acceleration)
Narration: For you not to be confused with the speed and acceleration concept, watch this video.
Video time: 00:00 - 01:50

Tabs 4 – 7 – Open Ended Questions
Narration: Answer the following questions and hit the email button, which can be found at the end of the collection, in sending the answers. The following guide questions will be prompted in the GLS:
Tab 4 - When do you know if a body is accelerating?
Tab 5 - What are the conditions for you to consider that a body is accelerating?
Tab 6 - Does a change in speed always indicate that a body is accelerating?
Tab 7 - Does a change in velocity always indicate that a body is accelerating?

Tab 8 – Physics Interactive
Narration: In this section, you will be exploring the different situations of an accelerating body considering it's direction. Remember, acceleration is a vector quantity, therefore, it's important to consider the signs. You will just be exploring the following situations: * Rightward Velocity with a Rightward Acceleration, * Rightward Velocity with a Leftward Acceleration * Leftward Velocity with a Leftward Acceleration * Leftward Velocity with a Rightward Acceleration Just focus on the animation!

Tab 9 – Interactive Physics Games
Narration: For concept self-check, explore this interactive. You need to match the animation to a verbal description.

Tabs 10- 14 – Revisiting Assessment No. 1.2.2 – Map of Conceptual Change (Anticipation – Reaction Guide) (Formative)
Narration (on the last tab): This is the last question. Make sure to hit the email button at the end of this playlist to email your answers in tabs 4,5,6 and 7.
Tab 10 - A car moving along a straight path at a constant speed is accelerating.
Tab 11 - A jeepney accelerates when it slows down.
Tab 12 - A ferrari moving at a constant speed around a race track is not accelerating.
Tab 13 - A body with zero acceleration is always at rest.
Tab 14 - An object moving at a constant speed and traveling along a straight path has a changing velocity.

II. INTERACTION

Students engage in varied activities to revise their prior knowledge and develop and deepen their new knowledge and answer to the Essential Question.
Teacher provides different ways of accessing content and developing required knowledge and competencies.
Teacher sets up different ways of blended learning.
Teacher conducts formative assessment.

DAY 2 (Date: ___________)

Objectives:

- Describe the motion of an accelerating body.
- Analyze situations and relate variables involving bodies that are accelerating.

LEARNING ACTIVITIES in CLASS

Task 1 – Keynote (Slides) – Synthesis on Acceleration Concepts (F2F)
Collaboratively, the teacher and students will answer the guide questions on bodies that are accelerating. The teacher will help the students in leading to the concept of bodies that are accelerating.

Task 2 – Video Streaming
The teacher shows a video on the real life applications of acceleration concepts and guide the students in formulating a generalized definition of a body which is accelerating. Inform the class to prepare for Assessment 3 – Conceptual Development on Acceleration.

LEARNING ACTIVITIES at HOME

NONE

DAY 3 (Date: ___________)
Objectives:

- Describe the motion of an accelerating body.
- Use the acceleration formula in solving for the variables: acceleration, initial velocity and final velocity.

LEARNING ACTIVITIES in CLASS

Task 1 – Assessment No. 1.2.3 – Conceptual Development on Acceleration (Google Forms) (Formative)
The students will be asked to answer Assessment No. 1.2.3. Their work will be checked afterwards. The teacher will flash on screen, the students' summary of answers and facilitate a class discussion.

LEARNING ACTIVITIES at HOME

Gooru Playlist Tasks
Playlist Overview: The students will be asked to navigate a Gooru Learning Playlist to understand the concepts of uniformly accelerated motion. Presented in the Playlist are different variables such as (a) initial velocity, (b) final velocity, and (c) time; discussion of the step-by-step procedure on how to compute for acceleration; and simple exercises for students to work on using pen and paper.

Tab 1 – Physics Interactive (Review on acceleration concept)
Narration: Let us further review the acceleration concept by going through this interactive page. This is a self-check page and you just need to answer the first two (2) items.

Tab 2 – Video Streaming (Acceleration Formula)
Narration: Knowing the conceptual definition of acceleration, let us go now to the formula in getting the acceleration of a moving body. Get your NB or any note taking app and make sure to take down notes of the formula and solutions. Video time: 02:32 - 06:49

Tab 3 – Webpage (Acceleration Formula)
Narration: For you to understand it better, kindly read this next resource, particularly the section "Calculating the Average Acceleration" and take note of the important items presented in the section.

Tab 4 – Video Streaming (Acceleration Problems)
Narration: Here are some sample problems on acceleration. Take down notes of the problems and solutions. Focus on how the variables (initial velocity, final velocity and time) are isolated. Sample problems are prepared for you to work on afterwards. Be patient! Video time: 00:00 - 10:22
Tab 5 – Physics Acceleration Problems
Narration: Have this one printed/copied on your NB. Answer the following questions and you may go back to the previous tabs. Be sure to be ready with your answers during our discussion next meeting!

DAY 4 (Date: ___________)
Objective:
- Use the acceleration formula in solving for the variables: acceleration, initial velocity and final velocity.

LEARNING ACTIVITIES in CLASS

Task 1 – Discussion of Sample Numerical Exercises (F2F)
Sample exercises given in the Gooru Learning will be discussed in class. Supplementary items and exercises may be given to students as needed.

LEARNING ACTIVITIES at HOME

NONE

DAY 5 (Date: ___________)
Objectives:
- Use the acceleration formula in solving for the variables: acceleration, initial velocity, and final velocity.
- Solve for a missing variable by deriving an appropriate equation from kinematics equations.

LEARNING ACTIVITIES in CLASS

Task 1 – Assessment No. 1.2.4 – Problem Set on Acceleration (Pen and Paper) (Formative)
Ask the students to accomplish the assessment. After they are done, discuss the answers as a class. Ask the students to generalize techniques involving acceleration problems.

LEARNING ACTIVITIES at HOME

Gooru Playlist Tasks
Playlist Overview: Video streaming on how the kinematic equations were derived. Playlist Slides will show simple techniques in dealing with the kinematic equations. Sample solved problems will be shown using the kinematic equations followed by simple exercises for students to work on.

Tab 1 – Video Streaming (Derivation of the Kinematic Equations – 1st Equation)
Narration: Kinematic equations are used to solve for variables involving objects which are moving at CONSTANT ACCELERATION. These variables include: (a) displacement; (b) initial velocity; (c) final velocity; (d) time and (e) acceleration. Kinematic equations include four (4) equations. The derivation of the first one is shown in this video. Take note of the derivation! Video time: 00:00 - 01:43

Tab 2 – Video Streaming (Derivation of the Kinematic Equations – 2nd Equation)
Narration: Here is the derivation of the second equation. In our class we will use "d" instead of "delta x" for the displacement. Video time: 01:17 - 02:06

Tab 3 – Video Streaming (Derivation of the Kinematic Equations – 3rd Equation)
Narration: Here's the derivation for the third equation. Again, we will use "d" instead of "delta x". FOIL method in Algebra was used here! Video time: 02:07 - 04:11

Tab 4 – Video Streaming (Derivation of the Kinematic Equations – 4th Equation)
Narration: For equation number 4, here is the derivation.

Tab 5 – Table Summary of Kinematic Equations
Narration: Here's a table summary of the kinematic equations which are being used for objects that are uniformly accelerating. Please note that the missing variable (the variable not mentioned in the problem, will give you a hint on which among the equations shall be used in the problem). Example, you are looking for "acceleration" but "displacement" is not mentioned/included in the problem. Thus, you will use equation number 1.

Tab 6 – Video Streaming (Sample Problem 1 – Problem Analysis)
Narration: For our first problem consider this. Video time: 02:08 - 03:23

Tab 7 – Video Streaming (sample Problem 1 – Solution)
Narration: Since the final velocity is not mentioned in the problem, we will use equation 4. Video time: 04:53 - 05:46

Tab 8 – Video Streaming (Sample Problem 2 – Problem Analysis)
Narration: Here is another example! Video time: 05:48 - 06:33

Tab 9 - Video Streaming (Sample Problem 2 – Solution)
Narration: This time, you were asked to look for the final velocity but the variable displacement was not mentioned (missing variable). Thus, you will use equation number 1. Video time: 07:37 - 08:02

Tab 10 – Simple Exercise
Narration: Starting from rest, the Road Runner accelerates at 3 m/s for 10 seconds. How far does the Road Runner travel during the ten- second interval?

DAY 6 (Date: ___________)
Objective:

- Solve for a missing variable by deriving an appropriate equation from kinematics equations.

LEARNING ACTIVITIES in CLASS

Task 1 – Discussion of Sample Numerical Exercises (F2F)
Sample exercises will be given for discussion. Supplementary items and exercises may be given to students as needed.

Task 2 – Clash of the Einsteins (Game)
Students are engaged in a game wherein they have to solve problems on acceleration using the UAM equations. The game shall be composed of three levels with varying difficulties. A winning pair will be declared at the end of the game.

LEARNING ACTIVITIES at HOME

NONE

DAY 7 (Date: ___________)

Objectives:

- Solve for a missing variable by deriving an appropriate equation from kinematics equations.
- Describe the motion of a freely falling body.

LEARNING ACTIVITIES in CLASS

Task 1 – Assessment No. 1.2.5 – Problem Set on Uniformly Accelerated Motion (Pen and Paper) (Formative)

Ask the students to accomplish the assessment. After they are done, discuss the answers as a class. Ask the students to generalize techniques involving acceleration problems.

LEARNING ACTIVITIES at HOME

Gooru Playlist Tasks

Playlist Overview: Students will accomplish first the online reflection journal. Students are to accomplish the AR worksheet to elicit prior knowledge on bodies that are freely falling. Students will again answer the assessment after the collection on freely falling bodies has been accomplished.

Tab 1 -7 - Online Reflective Journal

Narration: Good day students! Kindly accomplish this journal in order to help me understand your learning experiences and insights in using Gooru Learning. Please be reminded that this is formative in nature and I expect you to answer this form as honestly as you can.

Tab 1 - Did the use of Gooru help you understand the lesson on (TOPIC)? If yes, how did it help you in learning the concepts presented?

Tab 2 - My evaluation of my understanding level of the scientific concepts presented in this Playlist is

because

Tab 3 - Do you think that the use of Gooru Learning encourages you to think or work independently on study-related tasks more outside of the classroom?

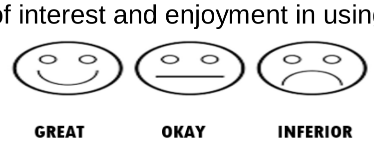
Tab 4 - What skills have you developed in understanding the topic by using Gooru Learning?

Tab 5 - My evaluation of my sense of responsibility in managing my own learning by using this Playlist is

because

Tab 6 - Do you think Gooru Learning is useful in studying Physics? Did the use of Gooru make you more engaged and interested in the topic?

Tab 7- My evaluation of my degree of interest and enjoyment in using this Playlist is



because

Tabs 8 - 11 - Assessment No. 1.2.6 – Map of Conceptual Change (AR Worksheet) (Formative)
Narration: Answer the series of questions to help me gauge your prior knowledge about the topic (initial answers). At the end of this Playlist, you will be answering the same set of questions for your final answers.
Tab 8 - Are objects dropped or thrown downward considered to be freely falling? Why?
Tab 9 - If a pen and a sheet of paper are simultaneously dropped from the same height, which will reach the ground first?
Tab 10 - Does air resistance matter in a free fall state?
Tab 11 - Do heavier objects fall faster than lighter objects?

Tab 12 – Video Streaming on Freely Falling Objects
Narration: This video tackles about the conditions for a body to be considered as freely falling. Take note on how the sign of the acceleration due to gravity has been resolved towards the end of the video. Most of the students get confused on this part. Video time: 00:00 - 12:12

Tab 13 – Video Streaming on Analyzing the Apollo 15 Feather and Hammer Drop
Narration: The teacher in the previous video mentioned about the Apollo 15. The video is courtesy of NASA: The 1971 Feather and Hammer Drop Experiment performed by Astronaut David Scott. This a great proof of how Galileo viewed falling objects initially. Video time: 00:00 - 01:27

Tab 14 – 17 – Revisiting Assessment No. 1.2.6 – Map of Conceptual Change (AR Worksheet) (Formative)
Narration: How will you answer the following questions after you have watched the videos? Do not forget to hit the email button after answering.
Tab 14 - Are objects dropped or thrown downward considered to be freely falling? Why?
Tab 15 - If a pen and a sheet of paper are simultaneously dropped from the same height, which will reach the ground first?
Tab 16 - Does air resistance matter in a free fall state?
Tab 17 - Do heavier objects fall faster than lighter objects?

III. INTEGRATION

The students:

make conclusions about their findings or results of investigating the EQ.
complete a map of conceptual change and compare their prior with their new knowledge.
reflect on their learning process and on how well they achieved their goals.
network with the world and share with a real world audience their performance task.
manifest the 7Cs of 21st Century Learning in their work.
connect their learning with the related Lasallian Guiding Principles.

The teacher:

provides scaffolding for students' performance task.
conducts summative assessments.
provides closure to lesson.

[PERFORMANCE TASK WEEK]

***scaffolding activities presented in this section may be done in any of the day/s.**

Objective:
Create an iBook presentation that will:

- raise the youth's understanding and awareness about the dangers of non-compliance with government-mandated traffic safety rules; and
- make the youth realize the importance of abiding by these rules.

Task 1 – Initial Preparation for the iBook presentation
The teacher discusses motion descriptors and includes situations involving road accidents. Students are to identify how motion concepts are applicable in different situations. An initial synthesis material will be provided for students to work on.

Task 2 - Tracking of Knowledge Changes / Daily Journal / Goal Setting
(Online Thinking/Learning Logs/KWL/ Activity Planner/ Learning Log))
The teacher asks the students to complete their day-to-day daily journal logs. The teacher presents EQs and related LGPs then gives ample time for students to review and align their personal goals/targets. Students reflect on their learning process and find out how well they achieved their goals through a checklist, activity planner, and learning log.

Task 3 – Seminar on Road Safety / Synthesis Material (F2F) (Slides)
Students will be attending a seminar on road safety. They will learn how Physics concepts about motion are applicable in observing traffic and the scientific bases behind the government-mandated traffic safety rules. A synthesis material will be answered by the students to find the relation of the seminar information to the Physics concepts learned in class.

Task 4 - Findings and Results (Slides/ Collaboration)
Based on the facts/information gathered from lectures, researches, collaboration-seminar with peers and experts, the students answer the EQs and write them on their thinking (picture, video) logs or portfolios.

Task 5 - Performance/ Transfer Task (F2F)
The students will perform a task in GRASPS form following an established rubric (industry level standards). In accomplishing the project, the students decide what interactive app to use and what other additional procedures are needed to produce the desired results. The main goal is to create an interactive iBook presentation that will raise the youth's understanding and awareness of the dangers of not following government-mandated traffic safety rules and make them abide by these rules. Students are to include the scientific bases for these government – mandated rules.

Task 6 - Sharing of New Knowledge (Wiki, Video Streaming, Screen Capture, Oral defense)
Students are asked to create a wiki, video stream, slide presentations or screen-captured presentations and upload these on a secured networking site. Students are to present their group's output through oral defense. The teacher facilitates the teaching – learning process.

Task 7 - Closure (F2F with Concept Maps/Learning Logs)
The students check if they were able to achieve "the end in mind". They review EQs, LGPs and personal targets. They also find out if a learning pathway is established that can be used as an effective learning habit or pattern.

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www.gooru.org / www.physicsclassroom.com

http://www.physicsclassroom.com/class/1DKin/Lesson-1/Scalars-and-Vectors

www.learner.org/interactives

Analyzing the Apollo 15 Feather and Hammer Drop - A Basic, Introductory Free-Fall Problem
https://www.youtube.com/watch?v=Gucr_OfzQ6M
by Flipping Physics

Introduction to Free-Fall and the Acceleration due to Gravity
https://www.youtube.com/watch?v=vyvDzI22sOE
by Flipping Physics

Distance and Displacement
https://www.youtube.com/watch?v=V8hJhTE3bUk
by The Science Classroom

Instantaneous speed and velocity | One-dimensional motion | Physics | Khan Academy
https://www.youtube.com/watch?v=pfTTHx9kCHk
by khanacademymedicine

Quiz 2 Speed and Velocity
http://www.physicslessons.com/quiz/quiz2.html
by Physics Lessons.com

Physics Lecture 11: Understanding how to use kinematic equations to solve problems
https://www.youtube.com/watch?v=jhkOddFEl9A
by Problem Solver

http://www.physicsclassroom.com/mmedia/kinema

http://www.physicsclassroom.com/Physics-Interactives/1-D-Kinematics/Name-That-Motion/Name-That-Motion-Interactive

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Rapatan, M. Q. (2015). *Next Generation blended Learning Materials*.

SET: ___

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High School Department

"Encountering Christ: We see Jesus in you."

CN: ___

UNIT: SCIENCE **AY:** 2016 -2017 **TERM:** 1 **SUBJECT:** PHYSICS

MODULE NO.: 1.2 **TYPE:** ☐PRE ☐SELF ■FOR ☐SUM **ASSESSMENT NO.:** 1.2.2

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: ANTICIPATION – REACTION GUIDE - ACCELERATION

K		P		U	

DIRECTIONS: Write your response for each statement in the BEFORE LESSON column only. Write A if you agree with the statement. Write B if you disagree with the statement. You will only answer the first column to give an idea of your prior knowledge about acceleration.

BEFORE LESSON	STATEMENTS	AFTER LESSON
	1. A car moving along a straight path at a constant speed is accelerating.	
	2. A jeepney accelerates when it slows down.	
	3. A Ferrari moving at a constant speed around a race track is not accelerating.	
	4. A body with zero acceleration is always at rest.	
	5. An object moving at a constant speed and traveling along a straight path has a changing velocity.	

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CN: ____

UNIT:	SCIENCE	**AY:**	2016 - 2017	**TERM:**	1	**SUBJECT:**	PHYSICS
MODULE NO.:	1.2	**TYPE:**	☐ PRE ☐ SELF ■ FOR ☐ SUM			**ASSESSMENT NO.:**	1.2.3
MODULE TITLE:	MECHANICS I						
ASSESSMENT TOPIC/S:	CONCEPTUAL DEVELOPMENT on ACCELERATION						

K	P	U
5	9	

NOTE: THIS ASSESSMENT WILL BE ANSWERED USING GOOGLE FORMS/GLS

Acceleration as a Rate Quantity

Acceleration is the rate at which an object's velocity changes. The velocity of an object refers to how fast it moves and in what direction. The acceleration of an object refers to how fast an object changes its speed or its direction. Objects with a high acceleration are rapidly changing their speed or their direction. As a rate quantity, acceleration is expressed by the equation:

$$a = \frac{v_f - v_i}{t}$$

Directions: For each of the items below, perform what is required.

1. Complete the statement below and write your answer on the space provided.
"The three controls in an automobile that cause it to accelerate are the ____________, ____________, and ____________."

2. Encircle the letter of ALL the answers that CORRECTLY completes the statement below.
"An object is accelerating if it is moving _____."
A. with changing speed
B. in a circle
C. extremely fast
D. downward
E. with constant velocity
F. none of these

For #s 3-4, encircle the letter of the answer that correctly completes the statement or answers the question. Pick one answer only.

3. *"An object that is NOT accelerating is ______."*
A. at rest
B. slowing down
C. moving with a constant speed along a curved path.
D. maintaining a constant velocity

4. *Spooch the kitten runs across the lawn at constant velocity until she notices an interesting bug sitting on the grass. She rapidly slows to a stop to check it out. Which of the following statements is FALSE?*
A. Spooch has a negative acceleration.
B. Spooch decelerated.
C. Spooch's velocity changed.
D. Spooch's speed changed but his velocity is unchanged.

5. Encircle the letter of ALL the answers that CORRECTLY completes the statement below.
"An object with an acceleration of 10 m/s² will ____."
A. move 10 meters in 1 second.
B. move 100 meters in 10 seconds
C. change its velocity by 10 m/s in 1 s
D. have a velocity of 100 m/s after 10 s

POINTS	DESCRIPTION	SCORING RUBRIC – CONCEPTUAL QUESTION
3	Explanation shows a clear understanding of the concepts. Two (2) key concepts about the topic are appropriately written.	
2	Explanation shows a quite clear understanding of the concepts. One (1) key concept about the topic is appropriately written.	
1	Explanation is unclear. No key concepts are written.	
0	No answer or wrong answer.	

For Nos. 6, 7a, and 7b, write your answer to the questions in the boxes provided after each item and refer to the scoring guide below.

6. You are driving north along a highway. Then, without changing speed, you round a curve and drive east. Does your velocity change? Do you accelerate? Explain.
7. (a) If the velocity of an object is zero, does it mean that its acceleration is zero? (b) If an object's acceleration is zero, does it mean that its velocity is zero? Provide at least two examples that will support your answer.
(a)
(b)

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"Encountering Christ: We see Jesus in you."

UNIT: SCIENCE **AY:** 2016 -2017 **TERM:** 1 **SUBJECT:** PHYSICS

MODULE NO.: 1.1 **TYPE:** ☐ PRE ☐ SELF ☒ FOR ☐ SUM **ASSESSMENT NO.:** 1.2.4

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: PROBLEM SET on ACCELERATION

K	P	U
	7.6	

NAME: **SECTION:**

TEACHER: **DATE:**

Directions: Solve all the given problems neatly and systematically. Express your final answer to three (3) significant figures only. Refer to the rubric scoring guide below:

POINTS	DESCRIPTION	SCORING RUBRIC – MATHEMATICAL SOLUTION
2.5	The solution is written correctly and completely. The final answer is correct and written using the correct number of significant figures and appropriate unit.	
2	The solution is written correctly but the final answer is written either with incorrect number of significant figures or wrong unit.	
1.5	The solution is written correctly but the final answer is written with incorrect number of significant figures and wrong unit.	
1	The solution is essentially incorrect and incomplete. An attempt to answer the problem is seen.	
0.5	The solution has a lot of errors. The final answer is incomplete.	
0	Wrong answer or no answer at all	

1. A car accelerates from rest along a straight road and reaches a speed of 75.0 km/h in 5.00 seconds. What is the magnitude of its acceleration in m/s?

FINAL ANSWER

2. It took 0.100 s before a baseball left the pitcher's hand. If the baseball uniformly accelerated at a rate of 300. m/s², compute for the final velocity of the ball after the 0.100-s period?

FINAL ANSWER

3. How long will it take for a car to travel from 10.0 m/s to 30.0 m/s if it is uniformly accelerating at a rate of 2.00 m/s²?

FINAL ANSWER

SET: ____

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High School Department

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UNIT: SCIENCE **AY:** 2016 -2017 **TERM:** 1 **SUBJECT:** PHYSICS

MODULE NO.: 1.1 **TYPE:** ☐ PRE ☐ SELF ☒ FOR ☐ SUM **ASSESSMENT NO.:** 1.2.5

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: PROBLEM SET on UNIFORMLY ACCELERATED MOTION

K	P	U
	16	

NAME: **SECTION:**

TEACHER: **DATE:**

Directions: Solve all the given problems neatly and systematically. Express your final answer to three (3) significant figures only. Refer to the rubric scoring guide below:

POINTS	DESCRIPTION — SCORING RUBRIC – MATHEMATICAL SOLUTION
2.5	The solution is written correctly and completely. The final answer is correct and written using the correct number of significant figures and appropriate unit.
2	The solution is written correctly but the final answer is written either with incorrect number of significant figures or wrong unit.
1.5	The solution is written correctly but the final answer is written with incorrect number of significant figures and wrong unit.
1	The solution is essentially incorrect and incomplete. An attempt to answer the problem is seen.
0.5	The solution has a lot of errors. The final answer is incomplete.
0	Wrong answer or no answer at all

1. An airplane accelerates along a runway at 3.20 m/s² for 32.8 s until it finally lifts off the ground. Determine the distance travelled before take-off.

FINAL ANSWER

2. A car starts from rest and accelerates uniformly over a time of 5.21 seconds over a distance of 110. m. Determine the acceleration of the car.

FINAL ANSWER

3. A race car accelerates uniformly from 18.5 m/s to 46.1 m/s in 12.5 seconds. Determine the (a) acceleration of the car and its (b) distance travelled.

(a)

FINAL ANSWER

(b)

FINAL ANSWER

4. Rocket-powered sleds are used to test the human response to acceleration. If a rocket-powered sled is accelerated to a speed of 444 m/s in 1.80 seconds, what is the sled's (a) acceleration and (b) distance travelled?

(a)

FINAL ANSWER

(b)

FINAL ANSWER

SET: ___	DE LA SALLE SANTIAGO ZOBEL SCHOOL High School Department	CN: ___

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UNIT: SCIENCE AY: 2016 -2017 TERM: 1 SUBJECT: PHYSICS

MODULE NO.: 1.2 TYPE: ☐ PRE ☐ SELF ■ FOR ☐ SUM ASSESSMENT NO.: 1.2.6

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: AR GUIDE – FREELY FALLING BODIES

K ___ P ___ U ___

NOTE: THIS ASSESSMENT WILL BE ANSWERED USING GOOGLE FORMS/GLS

GOORU NARRATION: Answer the series of questions to help me gauge your prior knowledge about the topic (initial answers). At the end of this Playlist, you will be answering the same set of questions for your final answers.

Question	INITIAL	FINAL
1. Are objects dropped or thrown downward considered to be freely falling? Why?		
2. If a pen and a sheet of paper are simultaneously dropped from the same height, which will reach the ground first?		
3. Does air resistance matter in a free fall state?		
4. Do heavier objects fall faster than lighter objects?		

APPENDIX D

Learning Plan and Assessments on Vertical Motion

De La Salle Santiago Zobel School

UNIT: SCIENCE | DEPARTMENT: HIGH SCHOOL | A.Y. 2016 - 2017

LASALLIAN NxGEN BLENDED LEARNING MODULE		
Teachers: Ms. Leah L. Lecerio, Mr. Salvador John M. Magalong, Ms. Arizza Mae Y. Santos	Grade/Year Level: G10	Subject: Physics
Term: Term 1, Module 1.3	Unit Topic: Mechanics	Time Frame: 6 Days

GENERAL LEARNING OBJECTIVES

CONTENT STANDARDS	PERFORMANCE STANDARDS
The learner demonstrates understanding of the descriptions of motion in one dimension.	The students will conduct a forum on mitigation and disaster risk reduction.

LASALLIAN GUIDING PRINCIPLES

✓	LGP 1: Challenge learners to realize their full potential.
	LGP 2: Bring Christian perspectives to bear on human understanding, skills and values of the learne
	LGP 3: Are dynamic and encourage differentiation, diversity and synergy amongst learners that are friendly, caring and respectful.
✓	LGP 4: Ensure that learners translate knowledge into something useful in actual practice for the bett of society.
✓	LGP 5: Prepare learners to participate responsibly in the world of work, family, community, nation, a church.

STAGE 1: ESTABLISHING DESIRED RESULTS

TRANSFER GOALS:

Students will be able to independently use their learnings in demonstrating and explaining to his/her community how concepts of motion in one and two dimensions are used in government mandated traffic rules.

ENDURING UNDERSTANDING:

Students will understand that the foundational descriptions of motion serve as the basis for the government- mandated traffic rules that motorists and pedestrians need to follow.

ESSENTIAL QUESTIONS:
Students will find the answers to the following questions: 3. When is a body considered to be in motion? 4. How do the concepts of motion explain the traffic safety rules that we have in the country?
ACQUISITION GOALS Knowledge: Describe the motion of an accelerating body. Process: Analyze situations and relate variables involving bodies that are accelerating. Use the acceleration formula in solving for the variables: acceleration, initial velocity, and final velocity. Solve for a missing variable by deriving an appropriate equation from kinematics equations.

LEARNING EVALUATION
STAGE 2: DETERMINING VALID EVIDENCE / ASSESSMENT
PRODUCT OR PERFORMANCE SHOWING EVIDENCE OF UNDERSTANDING & TRANSFER
iBOOK ON ROAD SAFETY
GRASPS NARRATIVE OF TRANSFER TASK
Due to an increasing number of accidents in your community, your traffic management council hired you to create an interactive iBook that will raise the youth's understanding and awareness of the dangers of not following government-mandated traffic safety rules and make them abide by these rules. You are to assume the role of: an info-campaign strategist who wishes to raise his constituents' awareness and understanding of the dangers of deliberately disobeying road rules. You are to share this iBook presentation to the young people in a chosen community and to the school's Junior HS students. The challenge also includes making the audience realize the importance of understanding road signs and following traffic safety rules imposed by your local officials, and the scientific bases of such traffic signs and rules. Your output will be assessed on content, visual appeal and assessment results. Your output in this task shall be used as the basis for your Term 1 Culminating Task on Planning an Organized Traffic Scheme: Metro Manila. Concepts and rules involved shall be implemented and reflected upon designing a scheme. *See attached rubric.* The following criteria are used in the rubric:

A. Content (50%)
  A.1 Subject Knowledge & Information
  A.2 Use of Accurate Motion Concepts
  A.3 Practicability of Content

B. Visual Appeal (20%)
  B.1 Pictures, Graphics, Slides Presentation
  B.2 Writing Mechanics (Grammar & Spelling)

C. Delivery (30%)
  C.1 Articulation
  C.2 Organization
  C.3 Interactiveness

Note: The PT in Unit 1 will be integrated to the PT of the next unit. An iBook presentation will be shared in the next unit involving the activities in the Newton's Olympics.

SCAFFOLD FOR TRANSFER			
LEVEL 1 Directed Prompt	LEVEL 2 Open Prompt	LEVEL 3 Guided Transfer	LEVEL 4 Independent Transfer
INTRODUCING DESCRIPTORS of MOTION CONCEPTS	IDENTIFYING PHYSICS CONCEPTS UNDERLYING ROAD AND TRAFFIC RULES	ATTENDING a SEMINAR on ROAD SAFETY	INFOMERCIAL PRESENTATIO N on ROAD SAFETY
The teacher will include situations involving incidents on roads when discussing the motion descriptors. Students are to identify how motion concepts are applicable in different situations.	The class will be divided into eight (8) groups. Students will research using their MLDs about governing rules on road and traffic in a particular area in Metro Manila. Students will identify five (5) mandated rules for motorists and will research on the scientific bases of these rules.	Students will be attending a seminar on road safety. They will learn how Physics concepts about motion are applicable in observing traffic, and the scientific bases of these government-mandated traffic safety rules. A synthesis material will be answered by the students to find the relation of the seminar information to the Physics concepts learned in class.	(please refer to GRASPS Narrative)

ASSESSMENT TOOLS (Unit Assessment Map)				
TYPE	KNOWLEDGE	PROCESS	UNDERSTANDING	PRODUCT/ PERFORMANCE
Pre-Assessment/ Diagnostic	Online Diagnostic (Pre-test)			
Formative	Map of Conceptual Change	Group Presentation Reflection Sharing Situation Analysis Problem Solving Laboratory Activities (Indoor and Field)	Real Life Applications Laboratory Activities (Indoor and Field)	Scaffold for Transfer
Summative	Short Assessments Post-test Laboratory Activities	Short Assessments Problem Solving Situation Analysis Map of Conceptual Change Laboratory Activities (Indoor and Field)	Map of Conceptual Change Short Assessments Laboratory Activities (Indoor and Field)	Infomercial Presentation on ROAD SAFETY
Self-Assessment		Reflection Journal	Reflection Journal	Portfolio

RELATED FACETS OF UNDERSTANDING
EXPLANATION: Students are to explain, in their laboratory reports and performance tasks, the importance of following government-mandated traffic safety rules. APPLICATION: Students are to identify the applications of the motion concepts in one dimension, particularly on observing road safety. SELF-KNOWLEDGE: Students are to independently use their learned concepts in showing his/her community how concepts of motion in one dimension are used in government mandated traffic rules. This includes road signs, local traffic safety rules, and their scientific bases.

BLENDED ACTIVITIES/TOOLS F2F and e-learning activities are aligned		
ENVIRONMENT ATTRIBUTES	FACE-TO-FACE	E-LEARNING
ACTIVE *Students investigate the Essential Question or a given situation, issue or problem. Students research in different sources and activities for information related to the EQ, situation or problem.*	oral recitation class discussion problem solving games	pretest with the use of Google polls/surveys Flipped Learning (Gooru Learning) • interactive activities • online games • virtual labs • simulation-based experiments
COLLABORATIVE *Students work in groups and discuss their ideas, answers, or solutions to EQ, problem or situation.* *Students take on roles to complete a group work.*	think-pair-share interview	station rotation (Gooru Learning) collaborative mobile apps
CONSTRUCTIVE *Students produce the content related to the knowledge and process competencies.* *Students form generalizations and conclusions based on different texts, situations, problems, and scenarios.* *Students answer the EQ and discuss the EU and justify their ideas with supporting examples.*	graphic organizers (illustrated or printed) oral recitation/defense, concept presentation, interview, discussion, socratic questioning, portfolio making	video streaming, assessments reflective journals slide presentations
AUTHENTIC *Students transfer their learning to real life situations. Students in their performance task show practical applications and solutions to the EQ, issue or problem situation.* *Students manifest the 7Cs of 21st century learning in their performance and product.*	project proposal/ presentation, oral defense, portfolio	simulation-based experiments, photo editing, mixed/augmented realities, animations, interactive activities, virtual lab
GOAL-DIRECTED *Students reflect on their learning process. Students manage their way of working. Students check every now and then how they are accomplishing the learning goals they set for themselves.*	graphic organizer, mind maps	scoring rubrics, e-portfolio

LEARNING PROCEDURE

STAGE 3: LEARNING PLAN FLOW

LESSON PROPER

II. INTRODUCTION

Teacher introduces topic and asks Essential Question.
Students give their ideas or prior knowledge about the Essential Question in Map of Conceptual Change. Teacher may probe prior knowledge with diagnostic test or misconception check (e.g., with help of online survey). Teacher notes variety of ideas and motivates students to find out which ideas are correct. Students engage in Goal-Setting.

PLEASE SEE MODULE 1.2 - DAY 7 FOR THIS PORTION

II. INTERACTION

Students engage in varied activities to revise their prior knowledge and develop and deepen their new knowledge and answer to the Essential Question.
Teacher provides different ways of accessing content and developing required knowledge and competencies.
Teacher sets up different ways of blended learning.
Teacher conducts formative assessment.

DAY 1 (Date: ___________)
Objective:

- Describe the motion of a freely falling body.

<u>LEARNING ACTIVITIES in CLASS</u>

Task 1 – Keynote (Slides) – Synthesis on Freely Falling Concepts
Discussion on the timeline on how concepts on freely falling bodies have developed. The teacher leads the students in extracting introductory key terms/concepts about free fall and stresses on the following points:

- An object is in free fall if it falls to the ground only by the action of gravity;
- An object in free fall covers a longer distance for every second of its fall;
- An object in free fall accelerates downward at 9.8 m/s every second; and
- Kinematics equations are used to determine the displacements and velocity of a free fall at any instant of its motion.

Task 2 – Assessment No. 1.3.1 – Conceptual Development on Freely Falling Bodies (Pen and Paper)
Students will answer Assessment No. 1.3.1 and their work will be checked afterwards. The teacher will then flash, on the screen, the students' summary of answers facilitated in a class discussion.

LEARNING ACTIVITIES at HOME

Gooru Playlist Tasks
Playlist Overview: Instructions on the laboratory experiment for the next day will be introduced. Students will make a laboratory report which will guide them in their experiment for the next day.
Tab 1 – Assessment No. 1.3.2 - Laboratory Activity – Freely Falling Bodies (F2F) (Station Rotation)
Narration: Hi students! Next meeting, we shall have our laboratory experiment on freely falling bodies. This activity will help you understand further the said topic. In preparation, kindly read the material and be ready for a 10-item pretest next meeting!

Tab 2 – Pre Laboratory Report
Narration: Kindly download this form, have it printed and fill out until the procedure part ONLY (for all stations). The remaining items will be answered during our laboratory period. In the procedure part, you just need to draw a flowchart of the steps presented in the station

DAY 2 - 3 (Date: ___________)
Objectives:
- Describe the motion of a freely falling body.
- Analyze situations and relate variables involving bodies that are freely falling.
- Use the kinematic equations in solving for the variables: displacement, acceleration, time, initial velocity and final velocity.

LEARNING ACTIVITIES in CLASS

Task 1 – Groupings
Instruct the students to group themselves to eight (8) groups and assign a leader.

Task 2 – Review of the Laboratory Procedures (F2F)
Review the safety precautions and guidelines to be observed during a laboratory experiment.
Task 3 - Assessment No. 1.3.2 - Laboratory Activity – Freely Falling Bodies (F2F)(Station Rotation)
The teacher reviews on the procedures and the expected output for the day. Let students perform the activity. Guide them as they carry out the procedure. Give them time to discuss among themselves the answers to the guide questions and come up with a conclusion.

LEARNING ACTIVITIES at HOME

NONE

DAY 4 (Date: ___________)
Objectives:
- Describe the motion of a freely falling body.
- Analyze situations and relate variables involving bodies that are freely falling.
- Use the kinematic equations in solving for the variables: displacement, acceleration, time, initial velocity and final velocity.

LEARNING ACTIVITIES in CLASS

Task 1 – Misconception Checking / Wrap Up (F2F)
The teacher holds a Post – Laboratory Discussion. Review the procedure of the activity. Point out and correct any misconceptions students may still have at this point. Come up with a generalization of the different situations in each laboratory station using an iPad app/PASCO Data studio of the following situations:

Station 1: Acceleration of a body on an Inclined Plane
Station 2: Galileo vs Aristotle
Station 3: Acceleration of a Ball
Station 4: Reaction Time

Task 2 – Accomplishment of Assessment No. 1.3.3 - Post Laboratory Assessment on Freely Falling Bodies
(Pen and Paper) (Summative)

LEARNING ACTIVITIES at HOME

Gooru Playlist Tasks
Playlist Overview: There will be a video streaming showing simple techniques in dealing with the kinematic equations. Sample solved problems will be shown using the kinematic equations followed by simple exercises for students to work on.

Tab 1 – Video Streaming (Sample Problem 1)
Narration: This Playlist will guide you on the step-by-step procedure in solving a problem. Let us consider this problem. Get ready with your NB and pen. Video time: 00:44 - 01:42

Tab 2 – Video Streaming (Sample Problem 1a - Solution)
Narration: Since the object is accelerating, we can make use of the kinematic equations! We are given with time, initial velocity and acceleration. The missing variable (not mentioned) is the final velocity. Thus, we will make use of equation number 4. What do you think will be the sign of the answer? Video time: 02:02 - 03:44

Tab 3 – Video Streaming (Sample Problem 1b - Solution)
Narration: Now, let us solve for the final velocity of the object before hitting the ground. We will consider now the displacement (y) as the missing variable. Thus, we will make use of equation number 1. However, there is something wrong with the sign of the final answer here, why is this so? Watch the video now. Video time: 03:48 - 04:44

Tab 4 – Video Streaming (Sample Problem 2)
Narration: Here is another example. Video time: 04:50 - 05:20

Tab 5 – Video Streaming (Sample Problem 2a - Solution)
Narration: Since the following variables were given: displacement (y); initial velocity and acceleration, we can make use of equation number 4 since the final velocity was not mentioned. Review isolating a variable lesson in your math class to derive an expression for finding time. Take note of the signs! Video time: 05:46 - 07:26

Tab 6 – Video Streaming (Sample Problem 2b - Solution)
Narration: In finding for the final velocity, we may use either equations 1 or 3 since both will help us find the mentioned variable. In this video, equation 1 was used. After watching, it is your task to double check the answer using equation 3. Video time: 07:26 - 08:29

Tab 7 – Practice Problems
Narration: Have this one printed/copied on your NB. Answer the following questions and you may go back to the previous tabs. Be sure to be ready with your answers during our discussion next meeting!

DAY 5 (Date: ___________)
Objectives:

- Use the kinematic equations in solving for the variables: displacement, acceleration, time, initial velocity and final velocity.
- Derive the appropriate equation when solving for the missing variable in the kinematic equations.

LEARNING ACTIVITIES in CLASS

Task 1 – Discussion of Sample Numerical Exercises (F2F)
Sample exercises given in the Gooru Learning will be discussed in the class. If the students are still confused on how to use the kinematic equations additional items may be given for students to master the problem solving process.

Task 2 – Assessment No. 1.3.4 – Problem Set on Freely Falling Bodies (Pen and Paper) (Formative)
Have students accomplish the assessment to be followed by the discussion of answers. The teachers asks the students to generalize techniques involving acceleration problems.

LEARNING ACTIVITIES at HOME

Students may view again the previous Playlist about Uniformly Accelerated Motion (horizontal and vertical).
Review slides for Assessment No. 1.3.5 may be given.

DAY 6 (Date: ___________)
Objectives:

- Explain the conditions when a body is considered to be uniformly accelerating.
- Solve, using numerical analysis, mathematical problems that involve free fall motion.
- Describe the horizontal and vertical motions of a projectile

LEARNING ACTIVITIES in CLASS

Task 1 - Accomplishment of Assessment No. 1.3.5 – Summative Assessment on Uniformly Accelerated Motion (Pen and Paper) (Summative)

LEARNING ACTIVITIES at HOME

<u>Gooru Playlist Tasks</u>

Playlist Overview: Students will accomplish first the online reflection journal. Initial discussion on projectile motion will be presented through video streaming on bodies moving in projectile motion. Students will accomplish a summary table for projectile motion.

Tab 1 -7 - Online Reflective Journal

Narration: Good day students! Kindly accomplish this journal in order to help me understand your learning experiences and insights in using Gooru Learning. Please be reminded that this is formative in nature and I expect you to answer this form as honestly as you can.

Tab 1 - Did the use of Gooru help you understand the lesson on (TOPIC)? If yes, how did it help you in learning the concepts presented?

Tab 2 - My evaluation of my understanding level of the scientific concepts presented in this Playlist is

Because

Tab 3 - Do you think that the use of Gooru Learning encourages you to think or work independently on study-related tasks more outside of the classroom?

Tab 4 - What skills have you developed in understanding the topic by using Gooru Learning?

Tab 5 - My evaluation of my sense of responsibility in managing my own learning by using this Playlist is

because

Tab 6 - Do you think Gooru Learning is useful in studying Physics? Did the use of Gooru make you more engaged and interested in the topic?

Tab 7- My evaluation of my degree of interest and enjoyment in using this Playlist is

because

Tab 8 – Projectile Motion Summary Table

Assessment No. 1.4.1 – Projectile Motion Summary Table

Narration: Download this form and answer it as you navigate through the Playlist. Be ready with this form next meeting!

Tab 9 – Video Streaming (Projectile Motion Concept)

Narration: In this Playlist, you will learn the concepts of projectile motion. Needed are the concepts involving horizontal and vertical (free fall) motion! Video time: 00:00 - 02:16

Tab 10 – Video Streaming (Projectile Motion Concept)

Narration: Make sure that you have understood the basic concepts involved in Projectile Motion. This video will explain how the horizontal and vertical motions (positions/displacements) were combined. Take note of the explanations. Video time: 02:17 - 06:32

Tab 11 – Video Streaming (Projectile Motion Concept)
Narration: This next video will explain the characteristics of the horizontal and vertical velocities of a projectile motion. Take note how the velocities change as the object undergoes a parabolic path. Video time: 06:32 - 08:15

Tab 12 – Video Streaming (Projectile Motion Concept)
Narration: Lastly, is the projectile accelerating? Let's watch this video! Video time: 08:15 - 09:28

III. INTEGRATION

The students:

make conclusions about their findings or results of investigating the EQ.
complete a map of conceptual change and compare their prior with their new knowledge.
reflect on their learning process and on how well they achieved their goals.
network with the world and share with a real world audience their performance task.
manifest the 7Cs of 21st Century Learning in their work.
connect their learning with the related Lasallian Guiding Principles.

The teacher:

provides scaffolding for students' performance task.
conducts summative assessments.
provides closure to lesson.

[PERFORMANCE TASK WEEK]
***scaffolding activities presented in this section may be done in any of the day/s.**

Objective:
Create an iBook presentation that will:

- raise the youth's understanding and awareness about the dangers of non-compliance with government-mandated traffic safety rules; and
- make the youth realize the importance of abiding by these rules.

Task 1 – Initial Preparation for the iBook presentation
The teacher discusses motion descriptors and includes situations involving road accidents. Students are to identify how motion concepts are applicable in different situations. An initial synthesis material will be provided for students to work on.

Task 2 - Tracking of Knowledge Changes / Daily Journal / Goal Setting
(Online Thinking/Learning Logs/KWL/ Activity Planner/ Learning Log))
The teacher asks the students to complete their day-to-day daily journal logs. The teacher presents EQs and related LGPs then gives ample time for students to review and align their personal goals/targets. Students reflect on their learning process and find out how well they achieved their goals through a checklist, activity planner, and learning log.

Task 3 – Seminar on Road Safety / Synthesis Material (F2F) (Slides)
Students will be attending a seminar on road safety. They will learn how Physics concepts about motion are applicable in observing traffic and the scientific bases behind the government-mandated traffic safety rules. A synthesis material will be answered by the students to find the relation of the seminar information to the Physics concepts learned in class.

Task 3 - Findings and Results (Slides/ Collaboration)
Based on the facts/information gathered from lectures, researches, collaboration-seminar with peers and experts, the students answer the EQs and write them on their thinking (picture, video) logs or portfolios.

Task 5 - Performance/ Transfer Task (F2F)
The students will perform a task in GRASPS form following an established rubric (industry level standards). In accomplishing the project, the students decide what interactive app to use and what other additional procedures are needed to produce the desired results. The main goal is to create an interactive iBook presentation that will raise the youth's understanding and awareness of the dangers of not following government-mandated traffic safety rules and make them abide by these rules. Students are to include the scientific bases for these government – mandated rules.

Task 6 - Sharing of New Knowledge (Wiki, Video Streaming, Screen Capture, Oral defense)
Students are asked to create a wiki, video stream, slide presentations or screen-captured presentations and upload these on a secured networking site. Students are to present their group's output through oral defense. The teacher facilitates the teaching – learning process.

Task 7 - Closure (F2F with Concept Maps/Learning Logs)
The students check if they were able to achieve "the end in mind". They review EQs, LGPs and personal targets. They also find out if a learning pathway is established that can be used as an effective learning habit or pattern.

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"Encountering Christ: We see Jesus in you."

UNIT: SCIENCE AY: 2016 -2017 TERM: 1 SUBJECT: PHYSICS

MODULE NO.: 1.3 TYPE: ☐ PRE ☐ SELF ■ FOR ☐ SUM ASSESSMENT NO.: 1.3.1

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: CONCEPTUAL DEVELOPMENT - FREELY FALLING BODIES

K	P	U
16		

NAME: ______________________ SECTION: __________

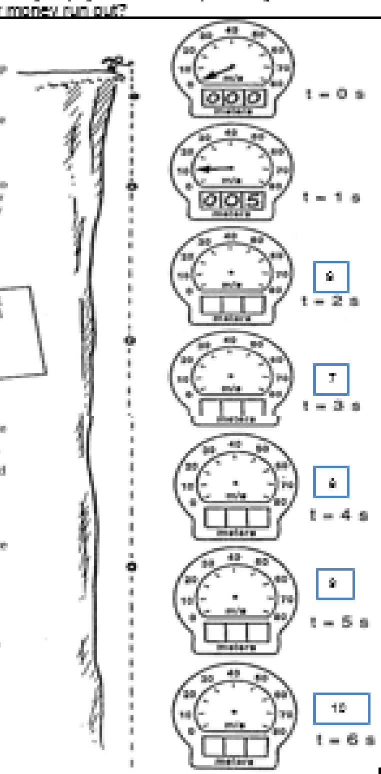
TEACHER: ______________________ DATE: __________

Directions: Fill out the necessary information asked in numbers 1-5 and 11-16. For the second part, draw the direction on which the arrow is pointed as seen in the speedometer attached, and the vertical distance the stone has travelled.

Aunt Minnie gives you $10 per second for 4 seconds	1. How much money do you have after 4 seconds?	
	2. A ball dropped from rest picks up speed at 10 m/s/s. After it falls for 4 seconds, how fast is it going?	
	3. You have $20, and Uncle Harry gives you $10 each second for 3 seconds. How much money do you have after 3 seconds?	
	4. A ball is thrown straight down with an initial speed of 20 m/s. After 3 seconds, how fast is it going?	
	5. You have $50 and you pay Aunt Minnie $10 every second. When will your money run out?	

Free Fall

A rock dropped from the top of a cliff picks up speed as it falls. Pretend that a speedometer and odometer are attached to the rock to show readings of speed and distance at 1-second intervals. Both speed and distance are zero at time = zero (see sketch). Note that after falling 1 second the speed reading is 10 m/s and the distance fallen is 5 m. The readings for succeeding seconds of fall are not shown and are left for you to complete. So draw the position of the speedometer pointer and write in the correct odometer reading for each time. Use $g = 10\ m/s^2$ and neglect air resistance.



11 The speedometer reading increases by the same amount, _______ m/s, each second.

12 This increase in speed per second is called ______________________.

13 The distance fallen increases as the square of the ______________.

14 If it takes 7 seconds to reach the ground, then its speed at impact is _________ m/s,

15 the total distance fallen is _______ m, and

16 its acceleration of fall just before impact is _______ m/s^2.

Source: Hewitt, P.G. (2005) Conceptual Physics 11th Ed. Pearson Education, Inc. DLSZ Physics Team 1617

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UNIT: SCIENCE AY: 2016 -2017 TERM: 1 SUBJECT: PHYSICS

MODULE NO.: 1.3 TYPE: ☐ PRE ☐ SELF ☒ FOR ☐ SUM ASSESSMENT NO.: 1.3.2

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: LABORATORY ACTIVITY – FREELY FALLING BODIES

K ___ P ___ U ___

[For this experiment, the OBJECTIVES, MATERIALS and PROCEDURE are provided for you.]

NOTE	A COMPLETE WRITE UP for EACH STATION INCLUDES: (A) Station Number and Title (B) Data and Results; and (C) Answer to Guide Question/s

STATION 1
MEASURING ACCELERATION on an INCLINED PLANE

Objective:
Compute for the acceleration of an object moving along an inclined plane and relate it to the angle of inclination.

Materials:
dynamic cart *inclined plane* *protractor*

Procedure:
Release the cart from the top of the ramp and time it as it reaches the end. Do this for different angles of inclination given in the data table below. Compute for the acceleration of the cart using the formula $a = \frac{v_f - v_i}{t}$. Observe the relationship of the tilt angle to the acceleration. (To convert from cm to meter, divide the value in cm by 100.)

Data and Results [COPY and ANSWER]

Angle of Inclination	Distance (m)	Time (s)	Acceleration (m/s²)
25°			
35°			
45°			
60°			
75°			

GQ [COPY and ANSWER]:
What do you think will happen to the value of acceleration as the angle approaches 90° and when it is at exactly 90°?

STATION 2
ACCELERATION due to GRAVITY

Objective:
Compute for the acceleration due to gravity.

Materials:
Ball *Meter stick* *Stopwatch*

Procedure:
Drop a ball from a height of more than 1.5 meters (You may need a chair to do this). Start the timer the moment you release the ball. Record the time the ball hits the ground. Compute for the acceleration due to gravity using the formula $a = 2d/t^2$. Perform three trials and compute for the average value of "a".

Data and Results [COPY and ANSWER]

Trials	Measured height in meters (m)	Time in seconds (s)	Acceleration in m/s² $a = 2d/t^2$
1			
2			
3			
AVERAGE VALUE of "a"			

GQ [COPY and ANSWER]:
1. How does your value for 'a' compare to the accepted value of the acceleration of a free falling object (9.8 m/s²)?
2. What factors do you think may cause the experimental value to be different from the accepted value?

STATION 3
"Galileo versus Aristotle" A Question of Free Fall

Objective:
Verify which of the arguments raised by Galileo and Aristotle exists in nature.

Materials:
3 index cards *3 balls (different compositions but same size)* *triple beam balance* *3 timers*

Procedure:
Measure and record the mass of each ball. Simultaneously drop the three balls from the same height of at least 1.5 m. Next, fold the three index cards. One should be folded to ½ its original size, the other to ¼, and the other to 1/8. Simultaneously drop the three index cards from the same height. Record on the table the time it takes for each ball/index card to hit the ground. Ask three members from your group, one for each object, to monitor the time of fall using a stopwatch. Timing should start the moment the objects are released and stop when the object hits the ground.

Data and Results [COPY and ANSWER]

TIME OF FALL OF THE BALLS		
	Mass	Time
Ball 1		
Ball 2		
Ball 3		

TIME OF FALL OF THE INDEX CARDS		
	Mass	Time
1/2 fold		
1/4 fold		
1/8 fold		

GQ [COPY and ANSWER]:
How will you analyze the data you have obtained? What factor/s affected the rate of fall of the objects?

STATION 4
REACTION TIME

Objective:
Compute for one's reaction time.

Materials:
ruler

Procedure:
Ask a partner to catch a ruler falling vertically without any signal when to start. You should make sure that the catcher's fingers are aligned to the zero (0) cm mark of the ruler. Record the distance measured in the ruler. Compute for your partner's reaction time using the formula

$$t = \sqrt{\frac{2d}{g}}$$

t = time
d = distance
g = acceleraton of gravity

where "g" is the acceleration due to gravity which is 9.8 m/s² and "d" is the distance the ruler has fallen. (To convert from cm to meter, divide the value by 100.). Compute for the reaction time of another member of the group.

Data and Results [COPY and ANSWER]

Name of Member (at least 2 members)	TRIAL 1		TRIAL 2		Average Reaction Time $(t_1+t_2)/2$ (s)
	Distance (m)	Reaction Time (s)	Distance (m)	Reaction Time (s)	

GQ [COPY and ANSWER]:
What does this experiment tell about how we respond to stimuli? How is our knowledge/awareness of our reaction time applicable in our daily lives?

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"Encountering Christ: We see Jesus in you."

UNIT: SCIENCE **AY:** 2016 -2017 **TERM:** 1 **SUBJECT:** PHYSICS

MODULE NO.: 1.3 **TYPE:** ☐ PRE ☐ SELF ☐ FOR ■ SUM **ASSESSMENT NO.:** 1.3.3

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: POST LABORATORY ASSESSMENT – FREE FALL STATIONS

K	P	U
	15	

NAME: **SECTION:**

TEACHER: **DATE:**

Directions: Read and analyze the following questions carefully. Refer to the scoring guide below.

POINTS	DESCRIPTION	SCORING RUBRIC – CONCEPTUAL QUESTION
3	Explanation shows a clear understanding of the concepts. Two (2) key concepts about the topic are appropriately cited.	
2	Explanation shows a quite clear understanding of the concepts. One (1) key concept about the topic is appropriately cited.	
1	Explanation is unclear. No key concepts are cited.	
0	No answer or wrong answer.	

1. How does the angle of inclination of the plane affect acceleration? Describe the behavior of the object released from a height as the angle approaches 90°.

2. Explain the significance of the presence of air resistance and friction on your readings for freely falling objects. Will the results be the same if none of these is present?

3. Based on your experiment, is the value of "g" constant? If not, what factors could have affected the variations in its value?

4. Explain the importance of computing one's reaction time on road safety. How does this concept apply in a car's safety feature? (e.g. in considering when exactly to press the brakes/

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UNIT: SCIENCE   AY: 2016 - 2017   TERM: 1   SUBJECT: PHYSICS

MODULE NO.: 1.3   TYPE: ☐ PRE ☐ SELF ☒ FOR ☐ SUM   ASSESSMENT NO.: 1.3.4

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: PROBLEM SET on FREELY FALLING BODIES

K	P	U
	12.5	

NAME: ______________________ SECTION: __________

TEACHER: ______________________ DATE: __________

Directions: Solve all the given problems neatly and systematically. Express your final answer to three (3) significant figures only. Refer to the rubric scoring guide below:

POINTS	DESCRIPTION — SCORING RUBRIC – MATHEMATICAL SOLUTION
2.5	The solution is written correctly and completely. The final answer is correct and written using the correct number of significant figures and appropriate unit.
2	The solution is written correctly but the final answer is written either with incorrect number of significant figures or wrong unit.
1.5	The solution is written correctly but the final answer is written with incorrect number of significant figures and wrong unit.
1	The solution is essentially incorrect and incomplete. An attempt to answer the problem is seen.
0.5	The solution has a lot of errors. The final answer is incomplete.
0	Wrong answer or no answer at all

1. A fire fighter jumps out of the window into a net. If the window is 29.8 m above the net, (a) at what speed does the fire fighter hit the net? (b) how long will it take the fire fighter to hit the net?

(a)

FINAL ANSWER

(b)

FINAL ANSWER

2. A stone is dropped on top of a building. If it takes 7.20 seconds for the stone to hit the ground, (a) how high is the building? (b) What is the stone's velocity just before it hits the ground?

(a)

FINAL ANSWER

(b)

FINAL ANSWER

3. How fast must a ball be thrown upward to reach a height of 12.6 m?

FINAL ANSWER

Source: Physics Book By Hickman, J.B.; Santos, G.N.; Ocampo, J.P.; Soto, R.L.

DLSZ Physics Team 1617

SET: A

DE LA SALLE SANTIAGO ZOBEL SCHOOL
High School Department

"Encountering Christ: We see Jesus in you."

CN: ____

UNIT: SCIENCE **AY:** 2016 -2017 **TERM:** 1 **SUBJECT:** PHYSICS

MODULE NO.: 1.3 **TYPE:** ☐ PRE ☐ SELF ☐ FOR ☒ SUM **ASSESSMENT NO.:** 1.3.5

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: SUMMATIVE ASSESSMENT on UNIFORMLY ACCELERATED MOTION

K	P	U
__ / 8	__ / 13	__ / 9

NAME: **SECTION:**

TEACHER: **DATE:**

I. KNOWLEDGE QUESTIONS

A. Read and analyze the following statements carefully. Write TRUE if the statement is correct and FALSE if otherwise.

________ 1. A car that speeds up has a constant velocity.

________ 2. A body maintaining a speed of 60 km/hr along a straight road is not accelerating.

________ 3. An object moving at a constant speed and traveling along a straight path is accelerating.

________ 4. An object moving at a constant speed and traveling along a straight path has a constant velocity.

B. Choose the letter that corresponds to the correct answer. Write the letter of your choice on the space before each number.

________ 5. A ball thrown upward experiences –

A. constant velocity. C. increasing velocity.
B. constant acceleration. D. increasing acceleration.

________ 6. A bullet is dropped into a river from a very high bridge. At the same time, another bullet is fired from a gun, straight down towards the water. Neglecting air resistance, how do the acceleration of the bullets compare as they strike the water?

A. same for each bullet C. greater for the dropped bullet
B. greater for the fired bullet D. depends on how high they started

________ 7. Which of the following statements is CORRECT for an object released from rest?

A. During each second, the object falls by 9.8 m.
B. The object falls 9.8 m during the first second.
C. The acceleration changes by 9.8 m/s² every second.
D. The average velocity during the first second is 4.9 m/s.

________ 8. Which of the following equations CANNOT be used to describe uniformly accelerating bodies mathematically?

A. $v_f = v_i + at$ C. $v_f^2 = v_i^2 + 2ad$
B. $d = \left(\frac{v_f + v_i}{2}\right)t$ D. $d = v_i t + \frac{1}{2}at^2$

II. PROCESS QUESTIONS

Solve the following problems systematically and completely. Express your final answers to three (3) significant figures only. For the conceptual part, highlight the major key points in your answer.

POINTS	DESCRIPTION — SCORING RUBRIC – MATHEMATICAL SOLUTION
2.5	The solution is written correctly and completely. The final answer is correct and written using the correct number of significant figures and appropriate unit.
2	The solution is written correctly but the final answer is written either with incorrect number of significant figures or wrong unit.
1.5	The solution is written correctly but the final answer is written with incorrect number of significant figures and wrong unit.
1	The solution is essentially incorrect and incomplete. An attempt to answer the problem is seen.
0.5	The solution has a lot of errors. The final answer is incomplete.
0	Wrong answer or no answer at all

POINTS	DESCRIPTION — SCORING RUBRIC – CONCEPTUAL QUESTION
3	Explanation shows a clear understanding of the concepts. Two (2) key concepts about the topic are appropriately cited.
2	Explanation shows a quite clear understanding of the concepts. One (1) key concept about the topic is appropriately cited.
1	Explanation is unclear. No key concepts are cited.
0	No answer or wrong answer.

Source: Physics Book by Hickman, J.B.; Santos, G.N.; Ocampo, J.P.; Soso, R.L., Ragasan, M. DLSZ Physics Team 1617

1. The tires of a certain car begin to lose their grip on the pavement at an acceleration of 5.00 m/s². If the car has this acceleration,

(a) how many seconds does it require to reach a speed of 25.0 m/s starting from 10.0 m/s?	(b) find the distance travelled at this time.
FINAL ANSWER	FINAL ANSWER

2. A bullet is fired directly upward and it returns to the same level after exactly one (1) minute. Find:

(a) initial velocity of the bullet	(b) height of highest point reached
FINAL ANSWER	FINAL ANSWER

(c) How would you describe the motion of the bullet if air friction is considered?

III. UNDERSTANDING QUESTION.

You are tasked to complete the table below by writing about how you think activities in the classroom have helped you answer the essential question presented at the beginning of the term. If in case you missed any of the preparatory activities given below, simply replace your missed preparatory activity with any other classroom activity that has helped you answer the EQ. Refer to the rubric scoring as you formulate your response.

Scoring Rubric for (A) Articles' Specific Answer to EQ and (B) Key Concepts	
Score	Description
5	All the activities' specific answer to the Essential Question are identified correctly and supported by accurate, correct, and completely written key concepts.
4	Almost all of the activities' specific answer to the Essential Question are identified correctly and supported by accurate, correct, and completely written key concepts.
3	Most of the activities' specific answer to the Essential Question are identified correctly and supported by accurate, correct, and completely written key concepts.
2	Some of the activities' specific answer to the Essential Question are identified correctly and supported by accurate, correct, and completely written key concepts.
1	Few of the activities' specific answer to the Essential Question are identified correctly and supported by accurate, correct, and completely written key concepts.
0	No answer or entirely wrong answer for the sections identified.

Scoring Rubric for (C) Similarities, (D) Differences, and (E) Generalization	
Score	Description
4	The similarities and differences among the key concepts are identified clearly and correctly leading to the correct general comparison and big idea affecting the differences among the key concepts. The generalization (direct answer to EQ) correctly follows through the general comparison and big idea. An additional example is correctly provided to fully support the generalization.
3	The similarities and differences among the key concepts are identified correctly and adequately enough and still lead to the correct general comparison and big idea affecting the differences among the key concepts. The generalization (direct answer to EQ) correctly follows through the general comparison and big idea.
2	The similarities and differences among the key concepts are identified correctly with few lacking details and somehow lead to the almost correct general comparison and big idea affecting the differences among the key concepts. The generalization (direct answer to EQ) follows through the identified general comparison and big idea.
1	The similarities and differences among the key concepts are identified but lacks most of the important details which leads to a poor general comparison and big idea affecting the differences among the key concepts. The generalization (direct answer to EQ) poorly follows through the identified general comparison and big idea.
0	No answer or entirely wrong answer for the sections identified.

Source: Physics Book by Hickman, J.B.; Santos, G.N.; Ocampo, J.P.; Soso, R.L., Ragasan, M. DLSZ Physics Team 1617

ESSENTIAL QUESTION:	WHEN IS A BODY CONSIDERED TO BE IN UNIFORMLY ACCELERATED MOTION?			
	A	B	C	D
PREPARATORY ACTIVITIES	HOW THESE ACTIVITIES SPECIFICALLY ANSWER THE ESSENTIAL QUESTION? *(State your answer in your OWN WORDS.)*	ONE (1) SPECIFIC EXAMPLE that DETERMINES ANSWER	WHAT THESE DIFFERENT CONDITIONS GENERALLY SHOW ABOUT THE ANSWER TO THE ESSENTIAL QUESTION [SIMILARITIES] *(Complete the statements below.)*	THE CONTROLLING BIG IDEA FOUND IN THE DIFFERENT CONDITIONS: (WHAT INFLUENCES THE VARIATION IN THE ANSWERS) [DIFFERENCES] *(Complete the statements below.)*
Gooru Playlists and Formative Assessments (Online/Pen and Paper)			*These different conditions show that … (how are they similar)*	*The different interpretations are influenced by… (how are they different)*
Laboratory Experiment – Instantaneous and Average Speeds				

E			
TOPIC ENDURING UNDERSTANDING RESULTING FROM THE DIFFERENT CONDITIONS AND CONTROLLING BIG IDEA *(Complete the statements on the right.)*	*Based on the different conditions and influence of the controlling big idea…*	*Another example that supports my generalization is….*	*because…*

APPENDIX E

Learning Plan and Assessments on Projectile Motion

LASALLIAN NxGEN BLENDED LEARNING MODULE		
Teachers: Ms. Leah L. Lecerio, Mr. Salvador John M. Magalong, Ms. Arizza Mae Y. Santos	Grade/Year Level: G10	Subject: Physics
Term: Term 1, Module 1.4	Unit Topic: Mechanics	Time Frame: 8 Days

GENERAL LEARNING OBJECTIVES	
CONTENT STANDARDS	**PERFORMANCE STANDARDS**
The learner demonstrates understanding of projectile motion.	The students will propose ways to enhance sports related to projectile motion.

LASALLIAN GUIDING PRINCIPLES

✓	LGP 1: Challenge learners to realize their full potential.
	LGP 2: Bring Christian perspectives to bear on human understanding, skills and values of the learners.
	LGP 3: Are dynamic and encourage differentiation, diversity and synergy amongst learners that are friendly, caring and respectful.
✓	LGP 4: Ensure that learners translate knowledge into something useful in actual practice for the betterment of society.
✓	LGP 5: Prepare learners to participate responsibly in the world of work, family, community, nation, and church.

STAGE 1: ESTABLISHED DESIRED RESULTS

TRANSFER GOALS:

Students will be able to independently use their learnings in demonstrating and explaining to his/her community how concepts of motion in two dimensions are used in sports activities.

ENDURING UNDERSTANDING:

Students will understand that the behavior of freely falling objects in one and two dimensions are applied as techniques in individual and team sports activities.

ESSENTIAL QUESTIONS:
Students will find the answers to the following questions: 1. When is a body considered to be in projectile motion? 2. How do concepts of projectile motion apply in sports?
ACQUISITION GOALS Knowledge: Describe the motion of an accelerating body. Describe the motion of a projectile launched horizontally. Describe the motion of a projectile launched at an angle. Process: Analyze situations and relate variables involving bodies that are accelerating. Use the acceleration formula in solving for the variables: acceleration, initial velocity and final velocity. Derive the appropriate equation when solving for the missing variable in the kinematic equations.

LEARNING EVALUATION
STAGE 2: DETERMINING VALID EVIDENCE / ASSESSMENT
PRODUCT OR PERFORMANCE SHOWING EVIDENCE OF UNDERSTANDING & TRANSFER
NEWTON'S OLYMPICS
GRASPS NARRATIVE OF TRANSFER TASK
Established on March 5, 1971 by a group of science fair winners, PHILIPPINE SOCIETY of YOUTH SCIENCE CLUBS or PSYSC aims to promote the Public Understanding of Science, Technology and the Environment (PUSTE) through its several activities and events. It is the only national federation of youth science clubs in the Philippines and is the first and largest science club umbrella organization in Asia. The society is continuously conducting activities geared towards the promotion of scientific interests and consciousness among our youth. As part of the delegation from PSYSC, you are to design and hold a series of activities applying Newton's Laws of Motion in a sports activity, an experiment or something similar, this will be called Newton's Olympics. The target audience is 13-year old students in school or an identified location. As the facilitator you must apply all the concepts you have learned to successfully transfer your understanding to the audience by means of providing them activities involving Newton's Laws. You will develop a plan that includes the step- by-step procedure of the task leading to the main concept/s. After the activities, you are expected to explain all the principles at work in your task and be able to relate Newton's Laws of Motion on the

infomercial you have prepared on road safety which will serve as a concrete example of its applications. You must summarize and monitor your team's progress in a journal as a proof that you have met your objectives in line with the PSYSC's vision and mission.

SCAFFOLD FOR TRANSFER			
LEVEL 1 Directed Prompt	LEVEL 2 Open Prompt	LEVEL 3 Guided Transfer	LEVEL 4 Independent Transfer
INTRODUCING DESCRIPTORS of MOTION CONCEPTS	IDENTIFYING PHYSICS CONCEPTS UNDERLYING SPORTS ACTIVITIES	PRESENTATION of SAMPLE NEWTON'S OLYMPICS PROGRAM and ACTIVITIES	PROGRAM on NEWTON'S LAWS of MOTION
The teacher will include situations involving sports activities when discussing forces and Laws of Motion. Students are to identify how Newton's Laws of Motion concepts are applicable in different situations guided by the teacher.	The class will be divided into ten (10) groups. Students will research using their MLDs the Laws of Motion governing in different sports activities. Students will research activities, other than sports, such as games, minute-to-win it tasks, etc.	Students will be watching sample Newton's Olympics activities. They will learn how Physics concepts are applicable in games and other sports activities. A synthesis material will be answered by the students to find the relation of Laws of Motion concepts to different activities.	(please refer to GRASPS Narrative)

ASSESSMENT TOOLS (Unit Assessment Map)				
TYPE	KNOWLEDGE	PROCESS	UNDERSTANDING	PRODUCT/ PERFORMANCE
Pre-Assessment/ Diagnostic	Pre-test			
Formative	Map of Conceptual Change Definition Completion	Map of Conceptual Change Group Presentation Reflection Sharing Situation Analysis Problem Solving Virtual Laboratory	Map of Conceptual Change Think-Feel-Act Real Life Virtual Laboratory Activities	Scaffold for Transfer

		Activities		
Summative	Short Assessments Post Laboratory Reports and Assessments	Short Assessments Problem Solving Situation Analysis Map of Conceptual Change Post Laboratory Reports and Assessments	Map of Conceptual Change Short Assessments Post Laboratory Reports and Assessments	Program on "Newton's Olympics"
Self-Assessment		Reflection Journal	Reflection Journal	Portfolio

RELATED FACETS OF UNDERSTANDING
EXPLANATION Students are to explain in their laboratory reports and performance tasks how concepts in two dimensions are applicable in sports activities. APPLICATION: Students are to identify the applications of the motion concepts in two dimensions. SELF-KNOWLEDGE: Students will be able to independently use their learned concepts in showing in his community how concepts of motion in two dimensions are used in sports activities.

BLENDED ACTIVITIES/TOOLS **F2F and e-learning activities are aligned**		
ENVIRONMENT ATTRIBUTES	FACE-TO-FACE	E-LEARNING
ACTIVE *Students investigate the Essential Question or a given situation, issue or problem. Students research in different sources and activities for information related to the EQ, situation or problem.*	oral recitation class discussion problem solving games	pretest with the use of Google polls/surveys Flipped Learning (Gooru Learning) • interactive activities • online games • virtual labs • simulation-based experiments

COLLABORATIVE *Students work in groups and discuss their ideas, answers, or solutions to EQ, problem or situation. Students take on roles to complete a group work.*	think-pair-share interview	station rotation (Gooru Learning) collaborative mobile apps
CONSTRUCTIVE *Students produce the content related to the knowledge and process competencies.* *Students form generalizations and conclusions based on different texts, situations, problems, and scenarios.* *Students answer the EQ and discuss the EU and justify their ideas with supporting examples.*	graphic organizers (illustrated or printed) oral recitation/defense, concept presentation, interview, discussion, socratic questioning, portfolio making	video streaming, assessments reflective journals slide presentations
AUTHENTIC *Students transfer their learning to real life situations. Students in their performance task show practical applications and solutions to the EQ, issue or problem situation.* *Students manifest the 7Cs of 21st century learning in their performance and product.*	project proposal/ presentation, oral defense, portfolio	simulation-based experiments, photo editing, mixed/augmented realities, animations, interactive activities, virtual lab
GOAL-DIRECTED *Students reflect on their learning process. Students manage their way of working. Students check every now and then how they are accomplishing the learning goals they set for themselves.*	graphic organizer, mind maps	scoring rubrics, e-portfolio

LEARNING PROCEDURE

STAGE 3: LEARNING PLAN FLOW

LESSON PROPER

III. INTRODUCTION

Teacher introduces topic and asks Essential Question.
Students give their ideas or prior knowledge about the Essential Question in Map of Conceptual Change. Teacher may probe prior knowledge with diagnostic test or misconception check (e.g., with help of online survey). Teacher notes variety of ideas and motivates students to find out which ideas are correct. Students engage in Goal-Setting.

PLEASE SEE MODULE 1.3 - DAY 6 FOR THIS PORTION

II. INTERACTION

Students engage in varied activities to revise their prior knowledge and develop and deepen their new knowledge and answer to the Essential Question.
Teacher provides different ways of accessing content and developing required knowledge and competencies.
Teacher sets up different ways of blended learning.
Teacher conducts formative assessment.

DAY 1 (Date: ___________)
Objective:

- Describe the horizontal and vertical motions of a projectile.

LEARNING ACTIVITIES in CLASS

Task 1 – Keynote (Slides) / Visual Exploration – Synthesis on Projectile Motion Concepts
Initial discussion on the comparison of the horizontal and vertical components of a projectile launched horizontally. Teacher leads the students in extracting introductory key terms/concepts about projectile motion and stresses on the following:

	Horizontal Motion	Vertical Motion
Velocity	CONSTANT	CHANGING (“g”)
Forces	NO	YES
Acceleration	NO	YES, DOWNWARD

Task 2 – Visual Exploration
Teacher will help students formulate initial generalizations on the different components of a projectile motion thru a simulation. (Students are still expected to be confused at this stage, thus, further discussion on the horizontal and vertical components of a projectile will still appear in Gooru Learning courses)

LEARNING ACTIVITIES at HOME

Gooru Playlist Tasks
Playlist Overview: Video presentation on the variables affecting the motion of a projectile launched horizontally. Questions will be prompted in the Playlist after discussion.

Tab 1 – Video Streaming (Projectile 1 – horizontal velocity)
Narration: Generally, we were able to discuss the characteristics of a projectile in terms of its' position, velocity and acceleration. In this Playlist, you will learn the concept of a projectile launched horizontally, which we will refer to as Projectile 1. Let us start first with the horizontal velocity (V_x). Video time: 01:13 - 02:09

Tab 2 – Video Streaming (Projectile 1 – vertical velocity)
Narration: Since there are no forces along the horizontal, the horizontal velocity (V_x) remains constant. Let us study now the vertical velocity (V_y) of Projectile 1. Video time: 02:10 - 03:00

Tab 3 - Video Streaming (Projectile 1 – acceleration)
Narration: The vertical velocity (V_y) of Projectile 1 changes (increasing at a constant rate) since it is affected by the gravitational force. Now, how would you describe the acceleration of the projectile at any point of its path? Video time: 03:00 - 03:36

Tab 4 - Video Streaming (Projectile 1 – effect of gravitational force)
Narration: This next portion explains how the gravitational force is related to the horizontal and vertical components of a projectile. Video time: 03:37 - 03:51

Tabs 5 - 8 – Video Streaming (True or False Statements)
Narration: To review all the concepts discussed, kindly answer the following true and false statements.
Tab 5 - A projectile with a horizontal component of motion will have a changing horizontal velocity.
Tab 6 - The horizontal velocity of a projectile is unaffected by the vertical velocity; these two components of motion are independent of each other.
Tab 7 - The vertical component of a projectile's velocity changes at a constant rate.
Tab 8 - A projectile with a rightward component of motion will have a rightward component of acceleration.

DAY 2 (Date: ___________)
Objective:

- Describe the horizontal and vertical motions of a projectile.

LEARNING ACTIVITIES in CLASS

Task 1 – Keynote (Slides) – Synthesis on Projectile Motion Concepts - Horizontal
Discussion on the different variables involved in a projectile launched horizontally using the concepts introduced in the Playlist. Teacher emphasizes on the following variables: (i) height; (ii) range; (iii) time of flight

Task 2 – Video Streaming
Students are to identify how the concepts of projectile launched horizontally is applied on situations presented in the video.

LEARNING ACTIVITIES at HOME

NONE

DAY 3 (Date: ___________)
Objectives:

- Describe the horizontal and vertical motions of a projectile.

- Investigate the relationship between the angle of release and the height and range of the projectile.

LEARNING ACTIVITIES in CLASS

Task 1 – Assessment No. 1.4.2 – Conceptual Development on Projectile Motion (Google Forms)
Students will answer Assessment No. 1.4.2 and checking of work afterwards. Teacher will flash on the screen the students' summary of answers then class discussion.

LEARNING ACTIVITIES at HOME

Gooru Playlist Tasks
Playlist Overview: Video streaming presentation on the relationship among the angle of release, height and range of a projectile. Students will do a simulation activity on projectile motion with guide questions. Through guided presentation, students will manipulate the different variables involving projectile motion. Students will generalize relationships among the variables. Questions will be prompted after the Playlist.

Tab 1 – Video Streaming (Projectile 2 – launched at an angle)
Narration: Hi students! This video shows how the launching angle of the projectile affects the horizontal distance traveled by a projectile. Observe. Series of questions will be asked after this. Video time: 00:00 - 00:32

Tab 2 - 4 – Open Ended Questions
Narration: **T**he following questions will help you understand the relationship between the variables mentioned. Good luck!
Tab 2 - When is the maximum range (horizontal distance travelled) attained?
Tab 3 - What happens to the range (horizontal distance travelled) as the angle increases from 0 degrees to 44 degrees?
Tab 4 - What happens to the range (horizontal distance travelled) as the angle increases from 46 degrees to 89 degrees?

Tab 5 – Simulation Activity Worksheet
Narration: For you to understand further the relationship between the launch angle, range and height let us have this simple activity. You need to download first this worksheet and the next tab will course you to the simulation site.

Tab 6 – PhET Simulation Activity
Narration: Projectiles travel with two components of motion, X (horizontal) and Y (vertical). The acceleration and velocity in the Y direction are independent of the acceleration (if any) and velocity in the X direction. In this Playlist, you will investigate the motion of a simple projectile. Realize that while gravity (acceleration) acts on the projectile in the y-direction (vertical), it does not affect the velocity of the projectile in the x- direction (horizontal).

Tabs 7 – 9 – Open Ended Questions
Narration: Hi, students! After watching the intro video and doing the simulation activity, you are ready now to answer the following questions and we will discuss the answers next meeting.
Tab 7 - How will you generalize the relationship between the angle of release and the range?
Tab 8 - How will you generalize the relationship between the initial velocity and the range?

Tab 9 - How will you generalize the relationship between the initial velocity and the height reached of the projectile?

DAY 4 (Date: ___________)
Objectives:

- Describe the horizontal and vertical motions of a projectile.
- Compute for the vertical and horizontal distances traveled by a projectile, given its initial velocity.
- Analyze situations and relate variables involving a projectile.

LEARNING ACTIVITIES in CLASS

Task 1 – Keynote (Slides) – Synthesis on Projectile Motion Concepts – Launched at an Angle
Using the guide questions from Gooru, discuss the different variables involved in a projectile launched at an angle. Teacher leads the students in extracting introductory key terms/concepts about projectile motion and stresses on the following:

	Horizontal Motion	Vertical Motion
Forces	NO	YES
Acceleration	NO	YES, DOWNWARD
Velocity	CONSTANT	CHANGING (“g”)

Task 2 – Visual Exploration (Air Physics)
Through guided presentation, students will use the Air Physics app to generalize relationships among the following variables: (i) maximum height reached; (ii) horizontal range; (iii) time of flight; (iv) angle launched.

Task 3 - Assessment No. 1.4.3 – Conceptual Development on Projectile Motion Launched at an Angle
(Google Forms)
Students will answer Assessment No. 1.4.3 and checking of work afterwards. Teacher will flash on the screen the students’ summary of answers then class discussion.

LEARNING ACTIVITIES at HOME

Gooru Playlist Tasks
Playlist Overview: Watch tutorial video on how to compute for range, height and angle of release for projectiles launched (a) horizontally and (b) at an angle. Students will work on simple problem involving direct substitution of values.

Tab 1 – Video Streaming (Projectile 1 – launched horizontally)
Narration: This Playlist will teach you how to solve problems involving Projectile 1 (horizontally launched projectile). Get your NB now and take down notes of the procedure. Let us consider and analyze this problem. Video time: 01:01 - 08:09

Tab 2 – Video Streaming (Projectile 1 – launched horizontally)
Narration: Since the projectile accelerates along the y-axis, we can make use of the kinematic equations in determining the time in the air. Since the final velocity is not mentioned in the problem, we can make use of equation 4. Video time: 08:09 - 10:02

Tab 3 – Derivation Guide (Projectile 1 – launched horizontally)
Narration: For the range (d), since the projectile does not accelerate along the horizontal, we cannot use the kinematic equations. Remember that the time for both components (vertical and horizontal) is the same, thus, we can make use of the answer. This next image will show the solution.

Tab 4 – Video Streaming (Projectile 1 – launched horizontally)
Narration: Now, what if you are given with the time and initial velocity? Let us consider this next problem. Video time: 17:16 - 18:15

Tab 5 – Derivation Guide (Projectile 1 – launched horizontally)
Narration: The next image shows how to derive an expression for the height.

Tab 6 – Video Streaming (Projectile 1 – launched horizontally)
Narration: For the complete solution. Watch this video. Video time: 18:15 - 18:47

Tab 7 – Derivation Guide (Projectile 1 – launched horizontally)
Narration: The next image shows the solution for the range (horizontal distance).

Tab 8 - Video Streaming (Projectile 2 – launched at an angle)
Narration: For Projectile 2, let us consider this problem. Video time: 00:00 - 03:00

Tab 9 – Video Streaming (Projectile 2 – launched at an angle)
Narration: Recall your vector resolution process. It is important to get the x and y components of the projectile to help you find the other unknowns.

Tab 10 - Video Streaming (Projectile 2 – launched at an angle)
Narration: In getting for the time, we will not use the kinematic equations, since the projectile does not accelerate along the horizontal direction. Thus, we can make use of the v=d/t equation. Video time: 08:53 - 11:55

Tab 11 – Projectile Motion Samples
Narration: Have this one printed/copied on your NB. Answer the following problems, you may go back to the previous tabs. Be sure to be ready with your answers during our discussion next meeting!

DAY 5 (Date: ___________)
Objectives:

- Compute for the vertical and horizontal distances traveled by a projectile, given its initial velocity.
- Analyze situations and relate variables involving a projectile.

LEARNING ACTIVITIES in CLASS

Task 1 – Discussion of Sample Numerical Exercises (F2F)
Sample exercises given in the Gooru Learning will be discussed in the class. If the students are still confused on how to use the equations additional items may be given for students to master the problem solving process.

Task 2 – Clash of the Einsteins (Game)
Students are engaged in a game wherein they have to solve problems on acceleration using the projectile motion equations. The game shall be composed of three levels with varying difficulties. A winning pair will be declared at the end of the game.

LEARNING ACTIVITIES at HOME

NONE

DAY 6 (Date: ___________)
Objectives:

- Compute for the vertical and horizontal distances traveled by a projectile, given its initial velocity.
- Analyze situations and relate variables involving a projectile.

LEARNING ACTIVITIES in CLASS

Task 1 – Assessment No. 1.4.4 – Problem Set on Projectile Motion (Pen and Paper) (Formative)
Have students accomplish the assessment to be followed by the discussion of answers. The teacher asks the students to generalize techniques involving projectile motion problems.

LEARNING ACTIVITIES at HOME

Students may view again the previous Playlist about Projectile Motion (launched horizontally and at an angle)
Review slides for Assessment No. 1.4.5 may be given.

DAY 7 (Date: ___________)
Objectives:

- Compute for the vertical and horizontal distances traveled by a projectile, given its initial velocity or vice versa.
- Analyze situations and relate variables involving a projectile.

LEARNING ACTIVITIES in CLASS

Task 1 - Accomplishment of Assessment No. 1.4.5 – Summative Assessment on Projectile Motion (Pen and Paper) (Summative)

LEARNING ACTIVITIES at HOME

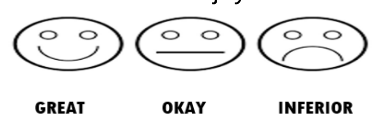
Gooru Playlist Tasks
Playlist Overview: Students will accomplish first the online reflection journal.

Tab 1 -7 - Online Reflective Journal
Narration: Good day students! Kindly accomplish this journal in order to help me understand your learning experiences and insights in using Gooru Learning. Please be reminded that this is formative in nature and I expect you to answer this form as honestly as you can.
Tab 1 - Did the use of Gooru help you understand the lesson on (TOPIC)? If yes, how did it help you in learning the concepts presented?

Tab 2 - My evaluation of my understanding level of the scientific concepts presented in this Playlist is

because
Tab 3 - Do you think that the use of Gooru Learning encourages you to think or work independently on study-related tasks more outside of the classroom?
Tab 4 - What skills have you developed in understanding the topic by using Gooru Learning?
Tab 5 - My evaluation of my sense of responsibility in managing my own learning by using this Playlist is

because
Tab 6 - Do you think Gooru Learning is useful in studying Physics? Did the use of Gooru make you more engaged and interested in the topic?
Tab 7- My evaluation of my degree of interest and enjoyment in using this Playlist is



because

DAY 8 (Date: ___________)
Objectives:

- Explain the conditions when a body is considered to be uniformly accelerating.
- Solve, using numerical analysis, mathematical problems that involve uniformly accelerated motion.
- Explain the conditions when a body is considered to be freely falling.
- Solve, using numerical analysis, mathematical problems that involve free fall motion.
- Describe the horizontal and vertical motions of a projectile
- Investigate the relationship between the angle of release and the height and range of the projectile.

Task 1 – Assessment No. 1.2.1 – Post -Test in Kinematics (Google Forms) (Formative)

III. INTEGRATION

The students:

make conclusions about their findings or results of investigating the EQ.
complete a map of conceptual change and compare their prior with their new knowledge.
reflect on their learning process and on how well they achieved their goals.
network with the world and share with a real world audience their performance task.
manifest the 7Cs of 21st Century Learning in their work.
connect their learning with the related Lasallian Guiding Principles.

The teacher:

provides scaffolding for students' performance task.
conducts summative assessments.
provides closure to lesson.

[PERFORMANCE TASK WEEK]

***scaffolding activities presented in this section may be done in any of the day/s.**

Objective:

- **Develop and implement Newton's Olympics that will be performed by the community.**

Task 1 – Initial Preparation for the Newton's Olympics (Wiki) (Physics Classroom) (Conceptual Physics)
The teacher includes situations involving sports activities, games, reality shows and the like while discussing the Laws of Motion. Students are to identify how forces and laws of motion concepts are applicable in different situations. An initial synthesis material will be provided for students to work on.

Task 2 - Tracking of Knowledge Changes / Daily Journal / Goal Setting
(Online Thinking/Learning Logs/KWL/ Activity Planner/ Learning Log)
The teacher asks the students to complete their day to day daily journal logs. The teacher presents EQs and related LGPs then gives ample time for students to review and align their personal goals/targets. Students reflect on their learning process and find out how well they achieved their goals through a checklist, activity planner and learning log.

Task 3 – Presentation of Newton's Olympics Videos / Synthesis Material (F2F) (Slides) (video Streaming)
Students will be given links to view previous Newton's Olympics programs. They will learn how Laws of Motion concepts are applicable in different sports related activities. A synthesis material will be answered by the students to find the relation of seminar information to Physics concepts.

Task 4 - Findings and Results (Slides/ Collaboration)
Based on the facts/information gathered from lectures, researches, collaboration-seminar with peers and experts, students answer EQs and draw conclusions. These findings and conclusions are written on their thinking (picture, video) logs or portfolios. Planned activities for the Olympics will be done in one of the laboratory periods having the lower grade level students as participants.

Task 5 – Performance / Transfer Task (F2F)
The students will perform a task in GRASPS form following an established rubric. In accomplishing the project, the students decide what interactive app to use and what other additional procedures are needed in order to produce the desired results. The main goal is to develop a plan and implement Newton's Olympics activities which includes the step- by-step procedure of the task leading to the main concept/s. After the activities, the students are expected to explain all the principles at work in the task and be able to relate Newton's Laws of Motion on the infomercial prepared on road safety which will serve as a concrete example of its applications. Students may conduct the activities among the Grade 10 students for them to be aware of the applications of Laws of Motion on road safety.

Task 6 - Sharing of New Knowledge (Wiki, Video Streaming, Screen Capture, Oral defense)
Students are asked to create a wiki, video stream, slide presentations or screen-captured presentations and upload these on a secure networking site. Students are to present their group's output through an oral defense. The students The teacher facilitates the teaching – learning process.

Task 7 - Closure (F2F with Concept Maps/Learning Logs)
The students check if they were able to achieve "the end in mind". They review EQs, LGPs and personal targets. They will also find out if a learning pathway is established that can be used as an effective learning habit or pattern.

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OTHERS
Rapatan, M. Q. (2015). *Next Generation blended Learning Materials*.

SET: ____	**DE LA SALLE SANTIAGO ZOBEL SCHOOL** High School Department	CN: ____

"Encountering Christ: We see Jesus in you."

UNIT: SCIENCE **AY:** 2016 -2017 **TERM:** 1 **SUBJECT:** PHYSICS

MODULE NO.: 1.4 **TYPE:** ☐PRE ☐SELF ■FOR ☐SUM **ASSESSMENT NO.:** 1.4.1

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: PROJECTILE MOTION SUMMARY TABLE

K	P	U

DIRECTIONS: Complete the table below by filling out the necessary information which can be learned from the Playlist.

		HORIZONTAL MOTION	VERTICAL MOTION
CONSTANT or CHANGING? If changing, by how much?	**1. VELOCITY**		
YES or NO?	**2. FORCES PRESENT?**		
If present, what direction?	**3. ACCELERATION PRESENT?**		

SET: ____

DE LA SALLE SANTIAGO ZOBEL SCHOOL
High School Department

CN: ____

"Encountering Christ: We see Jesus in you."

UNIT:	SCIENCE	AY:	2016 -2017	TERM:	1	SUBJECT:	PHYSICS
MODULE NO.:	1.4	TYPE:	☐ PRE ☐ SELF ■ FOR ☐ SUM			ASSESSMENT NO.:	1.4.2
MODULE TITLE:	MECHANICS I						
ASSESSMENT TOPIC/S:	CONCEPTUAL DEVELOPMENT on PROJECTILE MOTION LAUNCHED HORIZONTALLY						

K	P	U
16	6	

NOTE: THIS ASSESSMENT WILL BE ANSWERED USING GOOGLE FORMS/GLS

If a projectile is launched horizontally, **its horizontal component of motion remains constant**. The ball moves the **same horizontal distance** in equal time intervals, because **no horizontal component of force acts on it**. Gravity, directed toward the earth's center (downward), causes the ball to accelerate downward. The downward motion of a horizontally launched projectile is the same as that of free fall.

	1. Which of the following moving objects are considered projectiles?
	A kicked football
	A falling skydiver with an open parachute
	A feather falling in a vacuum chamber
	A small lead ball thrown horizontally from a height of 3 m
	An airplane flying through the sky

Read and analyze the following statements carefully. In the space provided before each item, write TRUE if the statement is correct and FALSE if otherwise. If you wrote FALSE, explain why. (*A space for the explanation will be reflected in the Google Forms/GLS.)

	2. A projectile is a free-falling object.
	3. A projectile is always moving in the downward direction.
	4. A projectile must be accelerating in the downward direction.
	5. A projectile could begin its motion with a downward velocity.
	6. A projectile with a rightward component of motion will have a rightward component of acceleration.
	7. The horizontal velocity of a projectile changes by 9.8 m/s each second.
	8. A projectile with a horizontal component of motion will have a constant horizontal velocity.
	9. The horizontal velocity of a projectile is unaffected by the vertical velocity; these two components of motion are independent of each other.
	10. The horizontal displacement of a projectile is dependent upon the time of flight and the initial horizontal velocity.
	11. The final horizontal velocity of a projectile is always equal to the initial horizontal velocity.
	12. The vertical component of a projectile's velocity is constant as it goes up.
	13. The vertical component of a projectile's velocity changes at a constant rate.
	14. A projectile will have a continuous downward acceleration throughout its motion.
	15. The magnitude of the vertical velocity of a projectile changes by 9.8 m/s each second.
	16. The vertical velocity of a projectile is unaffected by the horizontal velocity; these two components of motion are independent of each other.

For numbers 17 & 18, refer to this scoring rubric:

POINTS	DESCRIPTION — SCORING RUBRIC – CONCEPTUAL QUESTION
3	Explanation shows a clear understanding of the concepts. Two (2) key concepts about the topic are appropriately cited.
2	Explanation shows a quite clear understanding of the concepts. One (1) key concept about the topic is appropriately cited.
1	Explanation is unclear. No key concepts are cited.
0	No answer or wrong answer.

17. Two balls are rolling on a tabletop. Ball A is twice as fast as Ball B. If Ball A started further back than Ball B, and the two balls roll off the edge of the table simultaneously, which ball reaches the floor first? Explain.
18. Considering the aforementioned situation, how much further horizontally does A travel than B during its flight?

SET: ___	DE LA SALLE SANTIAGO ZOBEL SCHOOL High School Department	CN: ___

"Encountering Christ: We see Jesus in you."

UNIT: SCIENCE AY: 2016-2017 TERM: 1 SUBJECT: PHYSICS

MODULE NO.: 1.4 TYPE: ☐ PRE ☐ SELF ■ FOR ☐ SUM ASSESSMENT NO.: 1.4.3

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: CONCEPTUAL DEVELOPMENT on PROJECTILE MOTION LAUNCHED at an ANGLE

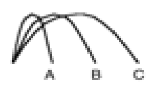
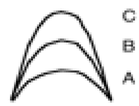
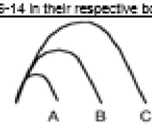
K	P	U
29	9	

NOTE: THIS ASSESSMENT WILL BE ANSWERED USING GOOGLE FORMS/GLS

Part I. Projectile motion is a combination of two separate motions: *constant horizontal speed*, and *constant vertical acceleration due to gravity*. For #s 1-5, a projectile is launched at an angle with an initial horizontal velocity of 20 m/s and an initial vertical velocity of 30 m/s.

QUESTIONS	ANSWER
1. What happens to the horizontal component of velocity of the projectile as it flies through air?	
2. What happens to the vertical component of velocity of the projectile as it reaches its peak height?	
3. At the projectile's maximum height, what is the magnitude of the horizontal component of its velocity?	
4. At the projectile's maximum height, what is the magnitude of the vertical component of its velocity?	
5. What is the magnitude of the initial velocity of the projectile?	

Part II. Refer to the diagrams and situations below. Answer the questions that follow for #s 6-14 in their respective boxes.

Diagram			
Situation	Projectile A, B, and C reached the same maximum height but landed in different places.	Projectile A, B, and C landed in the same place, but reached different maximum heights.	Projectile A, B, and C reached different maximum heights and landed in different places.
Which projectile was in the air the longest time?	(6)	(9)	(12)
Which projectile had the largest initial vertical velocity?	(7)	(10)	(13)
Which projectile had the largest horizontal velocity?	(8)	(11)	(14)

Part III. Read and analyze the following statements carefully. In the box provided before each item, write **TRUE** if the statement is correct and **FALSE** if otherwise. *(Note: If your answer is FALSE, explain why in the space provided in the Google Forms/GLS)*

	15. The horizontal velocity of a projectile is 0 m/s at the peak of its trajectory.
	16. The peak height reached by a projectile depends upon its horizontal velocity.
	17. As a projectile reaches the peak of its trajectory, its horizontal velocity decreases. As it falls from the peak of its trajectory, its horizontal velocity increases.
	18. The horizontal displacement or range of an upwardly launched projectile increases as the launch angle increases from 1 degree to 90 degrees.
	19. The horizontal displacement or range of an upwardly launched projectile always increases as the launch speed increases.
	20. The vertical component of a projectile's velocity is constant as it goes up.
	21. A projectile with an upward component of motion will have an upward component of acceleration.

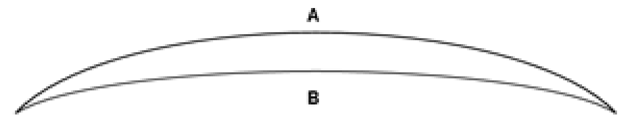
	22. The vertical velocity of a projectile is 0 m/s at the peak of its trajectory.
	23. The vertical acceleration of a projectile is 0 m/s² at the peak of its trajectory
	24. As a projectile reaches the peak of its trajectory, its acceleration is directed upward. As it falls from the peak of its trajectory, its acceleration is directed downward.
	25. The peak height of a projectile is dependent on its initial vertical velocity.
	26. As a projectile reaches the peak of its trajectory, its vertical velocity decreases. As it falls from the peak of its trajectory, its vertical velocity increases.
	27. The peak height of an upwardly launched projectile increases as the launch angle increases from 1 degree to 90 degrees.
	28. The peak height reached by an upwardly launched projectile increases as the launch speed increases.
	29. The horizontal velocity of a projectile is 0 m/s at the peak of its trajectory.

Part IV. Read each question and answer them accurately. Refer to the scoring guide below.

SCORING RUBRIC – CONCEPTUAL QUESTION

POINTS	DESCRIPTION
3	Explanation shows a clear understanding of the concepts. Two (2) key concepts about the topic are appropriately cited.
2	Explanation shows a quite clear understanding of the concepts. One (1) key concept about the topic is appropriately cited.
1	Explanation is unclear. No key concepts are cited.
0	No answer or wrong answer.

30. In the diagram below, two different possible trajectories are shown for a ball thrown by a center fielder to the home plate in a baseball game. Which of the two trajectories, A or B, will result in a longer time for the ball to reach the home plate? Explain.



31. Refer to the diagram in #30. If the two trajectories represent the throws of two different center fielders, which of the two is likely made by the player with the stronger arm? Explain. *(Note: The launch angle, θ, for each is < 45°)*

32. Refer to the diagram in #30. How does the speed of the ball at the peak height in trajectory A compare to the speed of the ball at the peak height in trajectory B?

SET: ____

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"Encountering Christ: We see Jesus in you."

UNIT: SCIENCE AY: 2016 -2017 TERM: 1 SUBJECT: PHYSICS

MODULE NO.: 1.4 TYPE: ☐PRE ☐SELF ☒FOR ☐SUM ASSESSMENT NO.: 1.4.4

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: PROBLEM SET on PROJECTILE MOTION

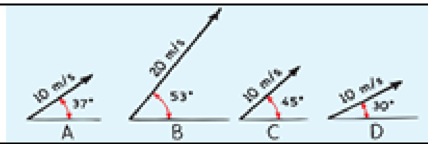
K		P		U	
—	28	—	10	—	

NAME: ____ SECTION: ____

TEACHER: ____ DATE: ____

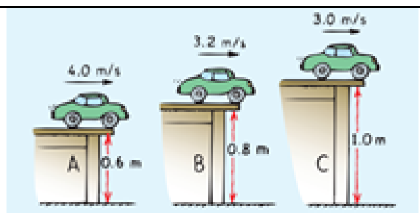
A. **Think and Rank.** Rank the quantity described in each item by following the required ranking description. Write the symbol or letter representing the quantity in the respective boxes. If quantities have equal rank, indicate it using an equal sign (for example, A = B).

1. Four projectiles (A, B, C, and D) are launched from the ground at different initial velocities and launch angles as shown.



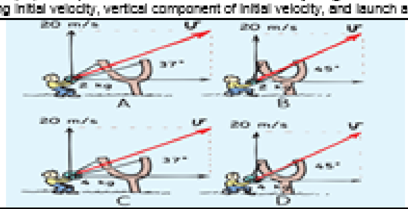
TASKS	GREATEST			LEAST
1.A. Rank the vertical components of velocity from greatest to least.				
1.B. Rank the horizontal components of velocity from greatest to least.				

2. Three similar toy cars (A, B, and C), horizontally launches at different speeds at the edge of tables of different heights as shown.



TASKS	GREATEST			LEAST
2.A. Rank the "hang times" from greatest to least.				
2.B. Rank the maximum horizontal displacements from greatest to least.				

3. Four water balloons (A, B, C, and D) of different masses are launched by slingshots. Refer to the diagram below for the information regarding initial velocity, vertical component of initial velocity, and launch angle.



TASKS	MAX		MIN
3.A. Rank the "hang times" from longest to shortest.			
3.B. Rank the magnitude of the peak heights from highest to lowest.			
3.C. Rank the maximum horizontal displacements from greatest to least.			

B. **Problem Solving:** Solve the given problems neatly and systematically. Express your final answer to three (3) significant figures only. Refer to the scoring guide below.

POINTS	DESCRIPTION — SCORING RUBRIC – MATHEMATICAL SOLUTION
2.5	The solution is written correctly and completely. The final answer is correct and written using the correct number of significant figures and appropriate unit.
2	The solution is written correctly but the final answer is written either with incorrect number of significant figures or wrong unit.
1.5	The solution is written correctly but the final answer is written with incorrect number of significant figures and wrong unit.
1	The solution is essentially incorrect and incomplete. An attempt to answer the problem is seen.
0.5	The solution has a lot of errors. The final answer is incomplete.
0	Wrong answer or no answer at all.

1. Erica kicks a soccer ball and launches it horizontally at 12.0 m/s from the edge of the roof of a 30.0-m high building. (a) When does the ball strike the ground? (b) At what velocity does the ball strike the ground?

(a)	(b)
FINAL ANSWER	FINAL ANSWER

2. A ball is thrown horizontally at 22.2 m/s from the roof of a building and lands at a 36.0-m horizontal distance from the building's base. How tall is the building?

FINAL ANSWER

3. If a ball is kicked at an initial velocity of 25.0 m/s at an angle of 60° above the ground, what is the ball's "hang time"?

FINAL ANSWER

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UNIT: SCIENCE AY: 2016-2017 TERM: 1 SUBJECT: PHYSICS

MODULE NO.: 1.4 TYPE: ☐ PRE ☐ SELF ☐ FOR ■ SUM ASSESSMENT NO.: 1.4.5

MODULE TITLE: MECHANICS I

ASSESSMENT TOPICS: SUMMATIVE ASSESSMENT on PROJECTILE MOTION

K	P	U
10	13	10

NAME: ______ SECTION: ______

TEACHER: ______ DATE: ______

I. **KNOWLEDGE QUESTIONS.**

A. Read and analyze the following statements carefully. Write TRUE if the statement is correct and FALSE if otherwise.

_______ 1. Horizontal motion is being acted upon by a horizontal force.

_______ 2. The vertical component of the velocity for a projectile increases as it rises.

_______ 3. Vertical motion of a projectile is affected by gravity, so it has a constant velocity.

_______ 4. A projectile that is launched at an angle has a vertical component that increases as it goes down.

_______ 5. Horizontal component of a projectile launched at an angle remains the same as it goes up.

B. Choose the letter that corresponds to the correct answer. Write the letter of your choice on the space before each number.

_______ 6. Which of the following statements BEST describes a projectile?
A. No horizontal force acts on it.
B. Its downward acceleration is constantly increasing.
C. It is continuously acted upon by a varying force; hence its vertical velocity is constant.
D. It is continuously acted upon by a net horizontal force; hence its horizontal velocity is constant.

_______ 7. A ball is thrown at an angle of 38° to the horizontal and travels as a projectile. What happens to the magnitude of the ball's vertical acceleration during the time that it is airborne?
A. It remains the same.
B. It increases, then decreases.
C. It decreases, then increases.
D. It decreases, then remains the same.

_______ 8. Refer to the diagram below. In the absence of air resistance, a stone thrown from point P follows a parabolic path and reaches its peak height at point T. The stone reaches point Q just before landing.

The vertical component of acceleration of the stone is -
A. zero at T. C. larger at Q than at T.
B. larger at T than at Q. D. the same at Q and T.

_______ 9. A stone is thrown upwards and follows a curved path as shown in the diagram below. In this case, air resistance is negligible.

Why does the stone's trajectory assume this shape?
A. The stone has a constant horizontal velocity and constant vertical acceleration.
B. The stone has a constant horizontal acceleration and constant vertical velocity.
C. The stone has a constant upward velocity followed by a constant downward velocity.
D. The stone has a constant upward acceleration followed by a constant downward acceleration.

_______ 10. Which of the following equations CANNOT be used to describe the motion of a projectile?
A. $v_x = d_x/t$ B. $v_{ix} = v_i\cos\theta$ C. $t_{up} = \frac{v_{iy}}{g}$ D. $d_y = v_{iy}t - \frac{1}{2}at^2$

Source: Physics Book by Hickman, J.B.; Santos, G.N.; Ocampo, J.P.; Sese, R.L., Ragasan, M. DLSZ Physics Team 1617

II. **PROCESS QUESTIONS** Solve the following problems systematically and completely. Express your answers to three (3) significant figures only. For the conceptual part, highlight the major key points in your answer.

POINTS	DESCRIPTION — SCORING RUBRIC – MATHEMATICAL SOLUTION
2.5	The solution is written correctly and completely. The final answer is correct and written using the correct number of significant figures and appropriate unit.
2	The solution is written correctly but the final answer is written either with incorrect number of significant figures or wrong unit.
1.5	The solution is written correctly but the final answer is written with incorrect number of significant figures and wrong unit.
1	The solution is essentially incorrect and incomplete. An attempt to answer the problem is seen.
0.5	The solution has a lot of errors. The final answer is incomplete.
0	Wrong answer or no answer at all
POINTS	**DESCRIPTION — SCORING RUBRIC – CONCEPTUAL QUESTION**
3	Explanation shows a clear understanding of the concepts. Two (2) key concepts about the topic are appropriately cited.
2	Explanation shows a quite clear understanding of the concepts. One (1) key concept about the topic is appropriately cited.
1	Explanation is unclear. No key concepts are cited.
0	No answer or wrong answer.

1. A stone was thrown horizontally at a speed of 12.0 m/s and covered a maximum horizontal distance of 12.0 m.

(a) How long did it take before the stone hits the ground?	(b) What is the vertical distance (height) from which the stone was thrown?
FINAL ANSWER	FINAL ANSWER

2. A tennis ball launcher, angled at 45 degrees, fired a tennis ball with an initial velocity of 15.0 m/s.

(a) How long would it take for the tennis ball to reach its peak height?	(b) How far away from the launcher will the ball hit the ground?
FINAL ANSWER	FINAL ANSWER

(c) How will you generalize the relationship among angle of release, height reached, and range travelled by a projectile?

Source: Physics Book by Hickman, J.B.; Santos, G.N.; Ocampo, J.P.; Sese, R.L., Ragasan, M. DLSZ Physics Team 1617

SET: A

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High School Department

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"Encountering Christ: We see Jesus in you."

UNIT: SCIENCE   AY: 2016 -2017   TERM: 1   SUBJECT: PHYSICS

MODULE NO.: 1.4   TYPE: ☐ PRE ☐ SELF ☐ FOR ■ SUM   ASSESSMENT NO.: 1.4.6

MODULE TITLE: MECHANICS I

ASSESSMENT TOPIC/S: PROJECTILE MOTION

K	P	U
		10

NAME: ____   SECTION: ____

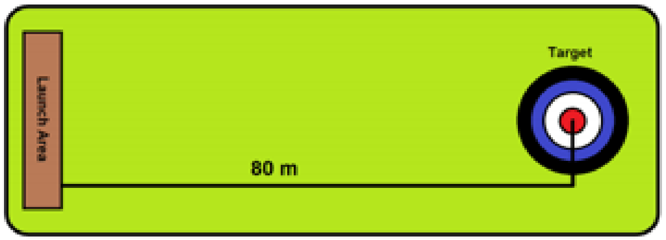
TEACHER: ____   DATE: ____

UNDERSTANDING QUESTION

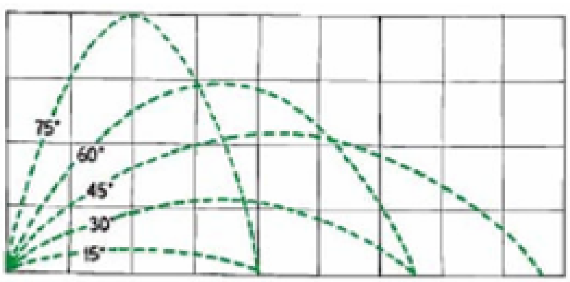
Last January, DLSZ was invited by the Regulus Spacetech Inc.to join the very first Water Bottle Rocket Olympiad to be held here in the Philippines. According to the Regulus Spacetech Inc., "Water Bottle rocketry is truly an exciting subject for students. Water rockets can boost and develop their curiosity, and extend the horizon of their learning and experience beyond science. The competition integrates design and manufacturing engineering for high school students of both private and public schools."

The aim of this challenge is to land the rocket as close to the target as possible. The target is 3 x 3 meters wide fixed flat on the ground. It will be placed 80 meters away from the launch area. Each team will be given one trial launch and two official launches. The distance of the point of impact to the target will be measured, the closest of the two official launches shall be considered the team's official distance. The launch will be considered failure if the rocket landed outside the perimeter area allocated for the target shooting challenge. The team with the shortest distance from the target will be the winner of the competition.

The Challenge: Target Shooting



In line with this, you are chosen to be one of the student-participants in the said contest. **In preparation for this task, you are to analyze the graph below which shows the range of projectiles as a function of the angle of launch as obtained from a virtual experiment. Note that Vi = 15 m/s for all the projectiles.**



A. What key concepts does the graph tell you about the launch angle, range covered, and the maximum height reached by projectiles? Refer to the scoring rubric below as you formulate your answers.

CONCEPTUAL ACCURACY AND UNDERSTANDING				
ADVANCED 5	PROFICIENT 4	APPROACHING PROFICIENCY 3	DEVELOPING 2	BEGINNING 1
Explanation shows exceptional understanding of the concept of Projectile Motion. It accurately identifies and explains the different variables related to Projectile Motion and its application. The understanding of the significance of applying relevant physics concepts in the given situation is presented very clearly.	Explanation shows a good understanding of the concept of Projectile Motion. It correctly identifies and explains the different variables related to Projectile Motion and its application. The understanding of the significance of applying relevant physics concepts in the given situation is presented clearly.	Explanation shows satisfactory understanding of the concept of Projectile Motion. It identifies and explains the different variables related to Projectile Motion and its application, although some items need to be explained more. The understanding of the significance of applying relevant physics concepts in the given situation is presented quite clearly.	Explanation shows limited understanding of the concept of Projectile Motion. Some variables related to Projectile Motion, and its application is identified but explanation needs a little more clarity. The understanding of the significance of applying relevant physics concepts in the given situation is presented vaguely.	Explanation shows limited understanding of the concept of Projectile Motion. Variables related to how objects move, and their applications are identified but no explanation is given. The understanding of the significance of applying relevant physics concepts in the given situation is not presented.

CONCEPTUAL EXPLANATION

____
____
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____

B. Put together your learned analytical skills on this topic to compute for the ideal <u>horizontal velocity and other conditions</u> to be considered to land the rocket on the target. Take note that gravity always acts vertically downward on the rocket, and limits the maximum height to around 34 meters. Use the scoring rubric below for the solution.

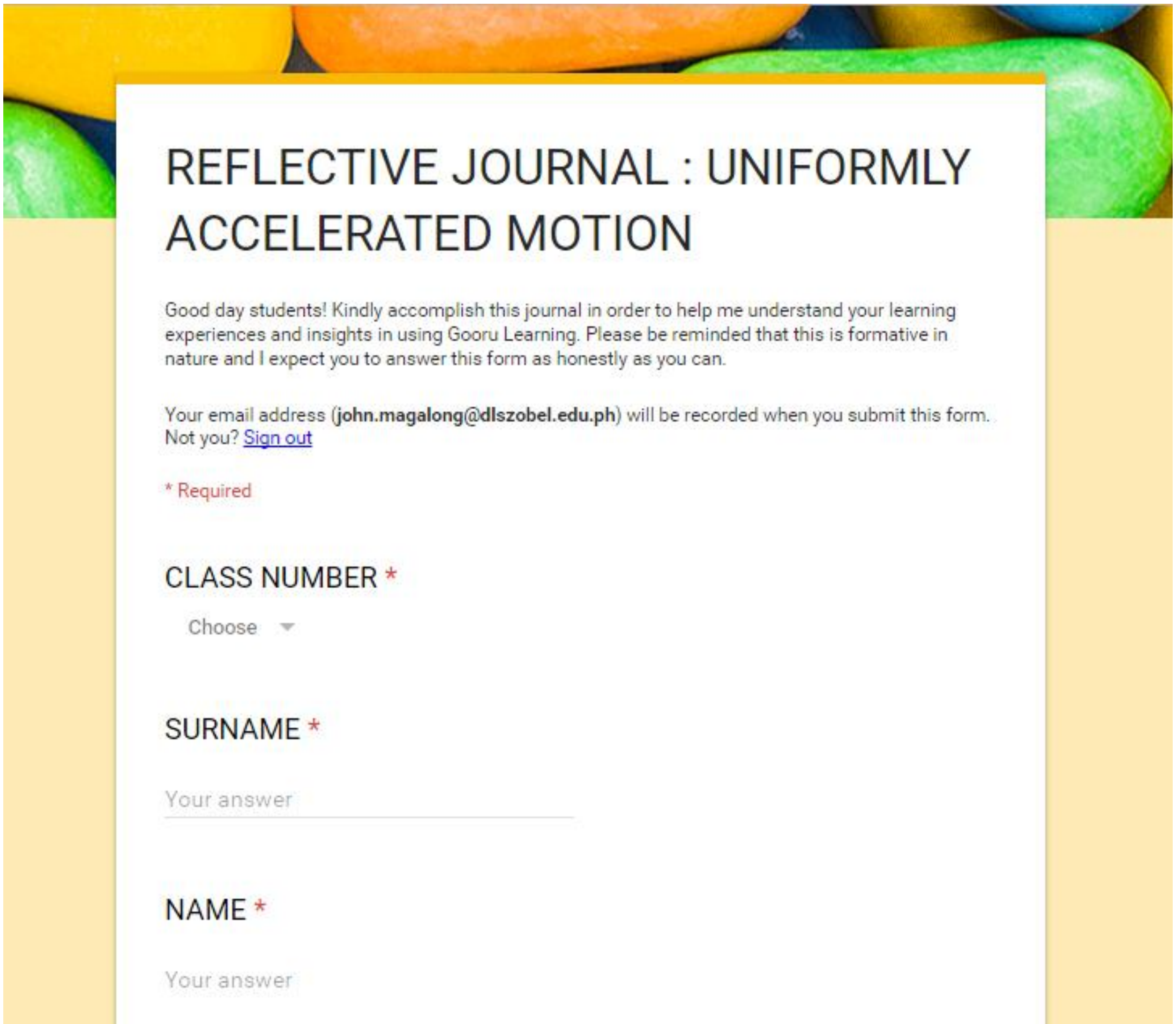
POINTS	DESCRIPTION — SCORING RUBRIC – GENERAL DESCRIPTION
5	The solution is written correctly and completely. The final answer is correct and written using the correct number of significant figures and appropriate unit. Conceptual explanation accurately and clearly justifies the numerical proof.
4	The solution is written correctly but the final answer is written either with incorrect number of significant figures or wrong unit. Conceptual explanation accurately justifies the numerical proof.
3	The solution is written correctly but the final answer is written with incorrect number of significant figures and wrong unit. Conceptual explanation is acceptable.
2	The solution is essentially incorrect and incomplete. An attempt to answer the problem is seen. Conceptual explanation is somewhat acceptable.
1	The solution has a lot of errors. The final answer is incomplete. Conceptual explanation is inaccurate and/or unclear.
0	Wrong answer or no answer at all. Conceptual explanation is not provided.

NUMERICAL PROOF

My answer is logical because...
____
____
____

APPENDIX F

Reflective Journal Template



REFLECTIVE JOURNAL : UNIFORMLY ACCELERATED MOTION

Good day students! Kindly accomplish this journal in order to help me understand your learning experiences and insights in using Gooru Learning. Please be reminded that this is formative in nature and I expect you to answer this form as honestly as you can.

Your email address (**john.magalong@dlszobel.edu.ph**) will be recorded when you submit this form. Not you? Sign out

* Required

CLASS NUMBER *

Choose

SURNAME *

Your answer

NAME *

Your answer

Your answer

SECTION *

Choose

1. Did the use of Gooru help you understand the lesson on UAM - horizontal motion? If yes, how did it help you in learning the concepts presented? *

Your answer

2. My evaluation of my understanding level of the scientific concepts presented in this Playlist is (choose from the image below), because... *

Your answer

3. Do you think that the use of Gooru Learning encourages you to think or work independently on study-related tasks more outside of the classroom? What skills have you developed in understanding the topic by using Gooru Learning? *

Your answer

4. My evaluation of my sense of responsibility in managing my own learning by using this Playlist is (choose from the image below), because... *

Your answer

5. Do you think Gooru Learning is useful in studying Physics? Did the use of Gooru make you more engaged and interested in the topic? *

Your answer

6. My evaluation of my degree of interest and enjoyment in using this Playlist is (choose from the image below), because... *

Your answer

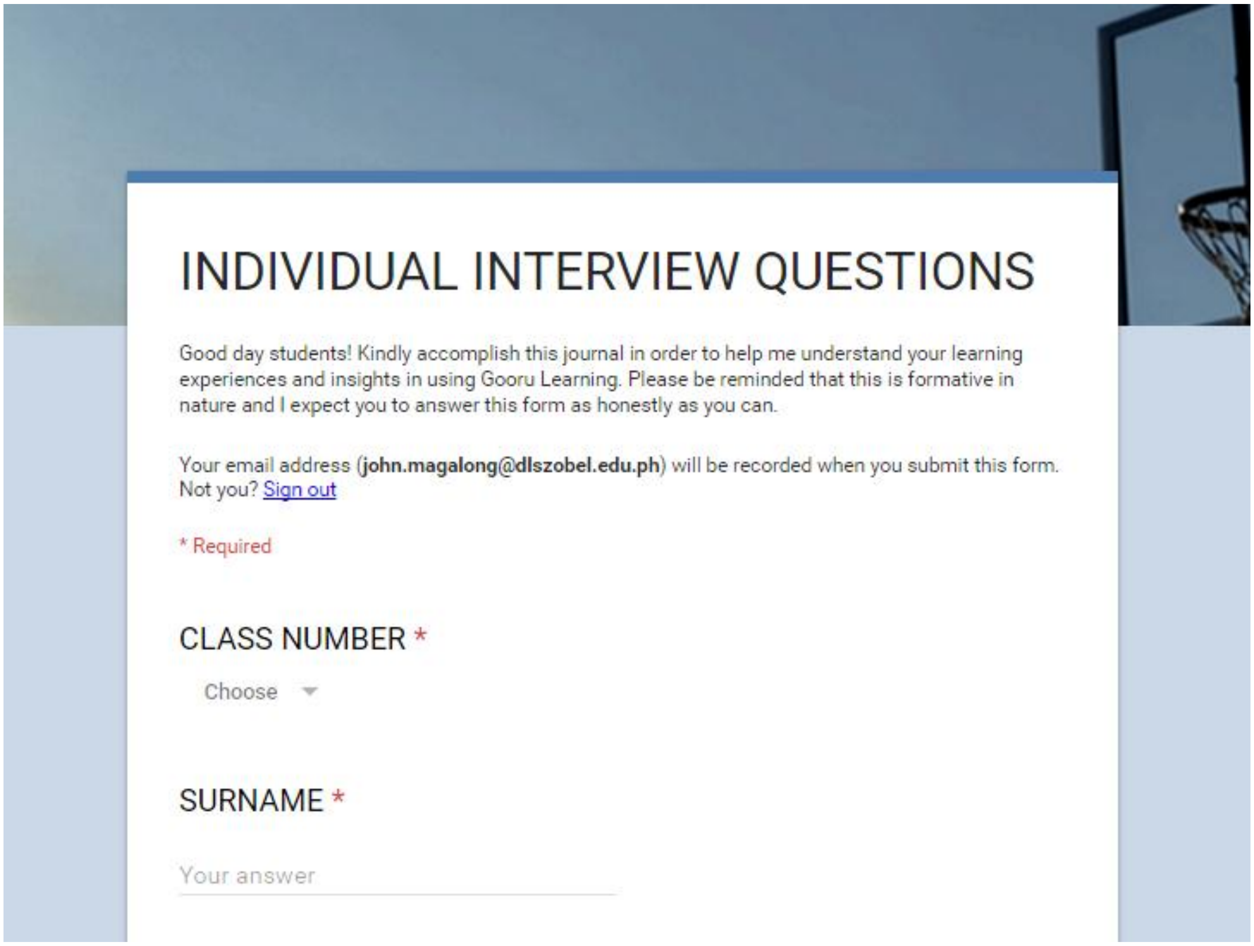
Send me a copy of my responses.

SUBMIT

Never submit passwords through Google Forms.

APPENDIX G

Post Individual Interview Questionnaire



INDIVIDUAL INTERVIEW QUESTIONS

Good day students! Kindly accomplish this journal in order to help me understand your learning experiences and insights in using Gooru Learning. Please be reminded that this is formative in nature and I expect you to answer this form as honestly as you can.

Your email address (**john.magalong@dlszobel.edu.ph**) will be recorded when you submit this form. Not you? Sign out

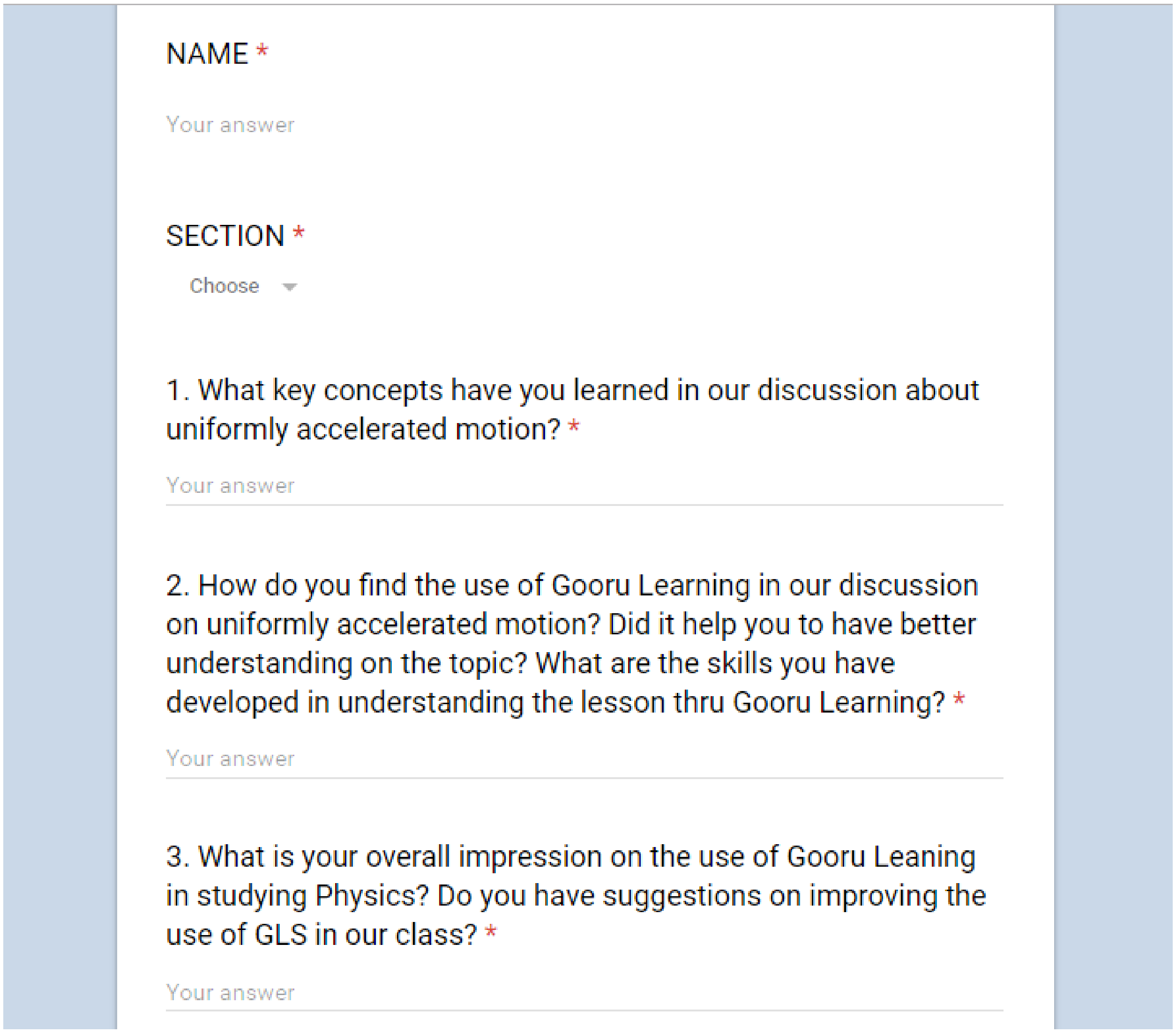
* Required

CLASS NUMBER *

Choose

SURNAME *

Your answer



NAME *

Your answer

SECTION *

Choose

1. What key concepts have you learned in our discussion about uniformly accelerated motion? *

Your answer

2. How do you find the use of Gooru Learning in our discussion on uniformly accelerated motion? Did it help you to have better understanding on the topic? What are the skills you have developed in understanding the lesson thru Gooru Learning? *

Your answer

3. What is your overall impression on the use of Gooru Leaning in studying Physics? Do you have suggestions on improving the use of GLS in our class? *

Your answer

APPENDIX H

Physics Achievement Test

(Pretest and Posttest)

DE LA SALLE SANTIAGO ZOBEL SCHOOL
High School Department

PRE-TEST in UNIFORMLY ACCELERATED MOTION

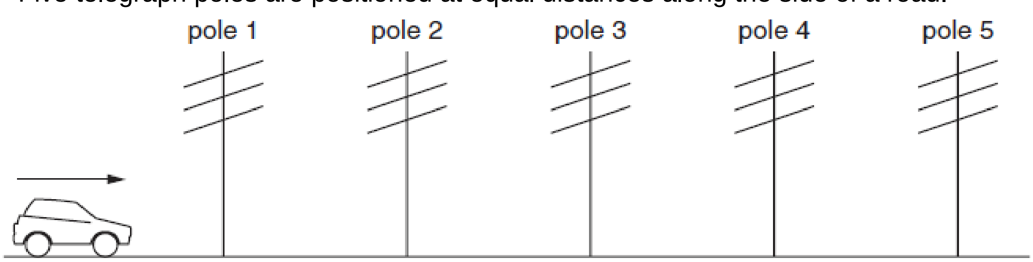
NOTE: THIS ASSESSMENT WILL BE ANSWERED USING GOOGLE FORMS

Directions: Read each question very carefully and choose the correct answer. Tick the corresponding letter of your choice in Google Forms.

1. The diagram shows a satellite that is moving at a uniform rate in a circular orbit around the Earth.

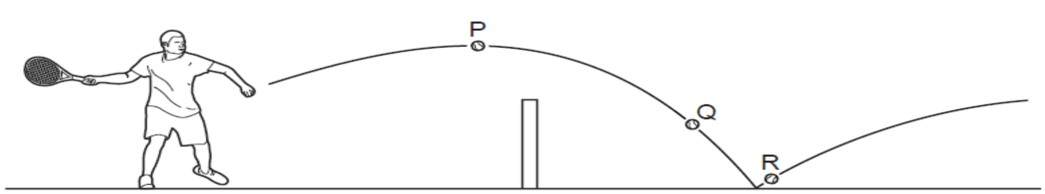
Which statement describes the motion of this satellite?
A. It is not accelerating but its speed is changing.
B. It is not accelerating but its velocity is changing.
C. It is accelerating because its speed is changing.
D. It is accelerating because its velocity is changing.

2. Five telegraph poles are positioned at equal distances along the side of a road.



A car accelerates until it reaches pole 4. The car then continues along the road at a steady speed. The time taken to travel between each pole and the next is measured. Which time is the greatest? The time between –
A. pole 1 and pole 2.
B. pole 2 and pole 3.
C. pole 3 and pole 4.
D. pole 4 and pole 5.

3. A tennis player hits a ball over the net.



In which positions is the ball accelerating?

A. P and Q only
B. P and R only
C. Q and R only
D. P, Q and R

4. Which of the following shows uniformly accelerated motion?
   A. a typhoon moving at 10 km/h North of East
   B. a car moving without changing its speed along a straight line
   C. a stone thrown upwards decreasing its speed by 10 m/s every second
   D. a car increasing its speed from rest to 10 m/s after 1 second and speeding up even faster to a speed of 30 m/s in the next second

5. An object can accelerate while moving at a constant speed. Which situation illustrates this?
   A. a car moving in a straight path
   B. a bus going uphill at constant speed
   C. a car moving around the oval at constant speed
   D. a car moving down a straight highway at constant velocity

6. An object moves from point P to point Q in ten seconds with uniform acceleration.

   Velocity at P = 5 m / s.
   Velocity at Q = 12 m / s.

   What is the value of its acceleration?

   A 0.5 m / s^2 B 0.7 m / s^2 C 1.2 m / s^2 D 1.7 m / s^2

7. A skater increases her speed uniformly from 2.0 m/s to 7.0 m/s over a distance of 12 meters. What is the magnitude of her acceleration as she travels this distance?

   A. 1.9 m/s^2 B. 2.2 m/s^2 C. 2.4 m/s^2 D. 3.8 m/s^2

8. The speed of a wagon increases from 2.5 m/s to 9.0 m/s in 3.0 s as it accelerates uniformly down a hill. What is the magnitude of the acceleration of the wagon during this 3.0-second interval?

   A. 0.83 m/s^2 B. 2.2 m/s^2 C. 3.0 m/s^2 D. 3.8 m/s^2

9. A car, initially traveling east with a speed of 5.0 m/s, is accelerated uniformly at 2.0 m/s^2 east for 10 seconds along a straight line. Compute for the distance travelled during this time interval.

   A. 50.0 m B. 60.0 m C. 100 m D. 150 m

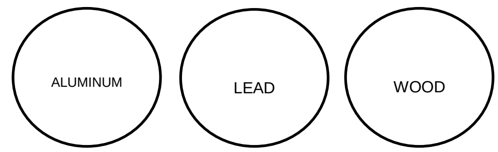
10. A car travelling at 25.3 m/s approaches to stop for a restaurant ahead. If the driver slams on the brakes with an acceleration of -6.40 m/s^2, what will be his stopping distance?

    A. 14.0 m B. 29.0 m C. 50.0 m D. 100.0 m

11. Rank the following objects according to the magnitude of the acceleration, from LEAST to GREATEST.
    1. a car accelerating from 20 m/s to rest in 1.0 s.
    2. a jogger accelerating from 2.0 m/s to 1.0 m/s in 8.3 s.
    3. a falling fruit accelerating from 0.50 m/s to 10.3 m/s in 1.0 s.
    4. while being hit, a golf ball accelerating from rest to 4.3 m/s in 0.40 s.

A. 1 – 3 – 2 – 4
B. 2 – 4 – 1 – 3
C. 1 – 4 – 3 – 2
D. 2 – 3 – 4 – 1

12. The three balls shown are dropped from a bench.



Which balls have the SAME acceleration?
A. lead and wood only
B. aluminum and lead only
C. aluminum and wood only
D. aluminum, lead and wood

13. A piece of flat white paper is dropped and falls to the floor. The same piece of paper is then crumpled into a ball and dropped again. Which of the following will change in the second situation?
A. the weight of the paper
B. the initial acceleration when dropped
C. the time taken to reach terminal velocity
D. the maximum magnitude of the air resistance

14. Two stones of different weights were released at the same time from a table. What will happen and why? Air resistance may be ignored.

	what will happen	why
A	both stones hit the floor at the same time	the acceleration of free fall is constant
B	both stones hit the floor at the same time	they fall at constant speed
C	the heavier stone hits the floor first	acceleration increases with weight
D	the heavier stone hits the floor first	speed increases with weight

15. An experiment is performed to measure the acceleration of free fall “g”. A body falls between two fixed points. The following variables were measured. Which measurement is NOT required for the calculation of “g”?
A. the mass of the body
B. the initial velocity of the body
C. the distance fallen by the body
D. the time taken for the body to fall

16. A ball is thrown vertically upward with an initial velocity of 29.4 meters per second. What is the maximum height reached by the ball? Neglect friction.
A. 14.7 m B. 29.4 m C. 44.1 m D. 88.1 m

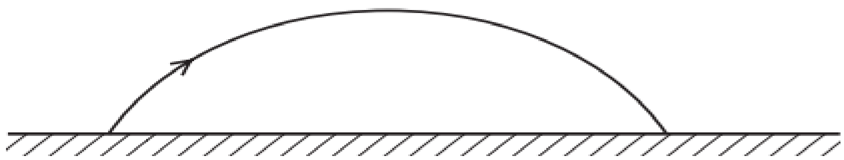
17. A rock falls from rest off a high cliff. How far has the rock fallen when its speed is 39.2 meters per second? Neglect friction.
A. 19.6 m B. 44.1 m C. 78.4 m D. 123 m

18. A ball thrown vertically upward reaches a maximum height of 30 meters above the surface of Earth. At its maximum height, the speed of the ball is ______.
A. 0.0 m/s B. 3.1 m/s C. 9.8 m/s D. 24 m/s

19. A ball dropped from rest falls freely until it hits the ground with a speed of 20 meters per second. The time during which the ball is in free fall is approximately ______.

A. 0.5 s B. 1 s C. 2 s D. 10 s

20. The diagram shows the path of a golf ball.



Which row describes changes in the horizontal and vertical components of the golf ball's velocity, when air resistance forces are ignored?

	horizontal	vertical
A	constant deceleration	constant acceleration downwards
B	constant deceleration	acceleration decreases upwards then increases downwards
C	constant velocity	constant acceleration downwards
D	constant velocity	acceleration decreases upwards then increases downwards

21. Four projectiles, A, B, C, and D, were launched from, and returned to, level ground. The data table below shows the initial horizontal speed, initial vertical speed, and time of flight for each projectile.

Projectile	Initial horizontal speed (m/s)	Initial vertical speed (m/s)	Time of Flight (s)
A	40.0	29.4	6.0
B	60.0	19.6	4.0
C	50.0	24.6	5.0
D	80.0	19.6	4.0

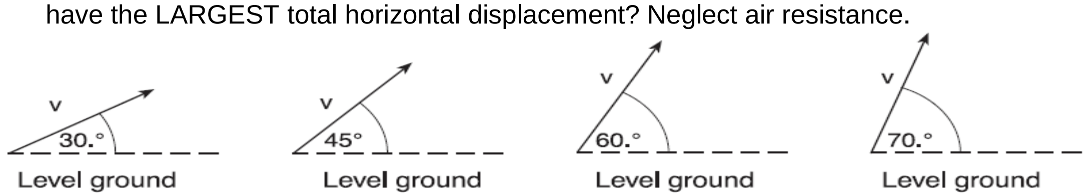
Which projectile traveled the GREATEST horizontal distance? Neglect air friction.

A. Projectile A B. Projectile B C. Projectile C D. Projectile D

22. A machine launches a tennis ball at an angle of 25° above the horizontal at a speed of 14 m/s. The ball then returns to level ground. Which combination of changes must produce an increase in time of flight of a second launch?

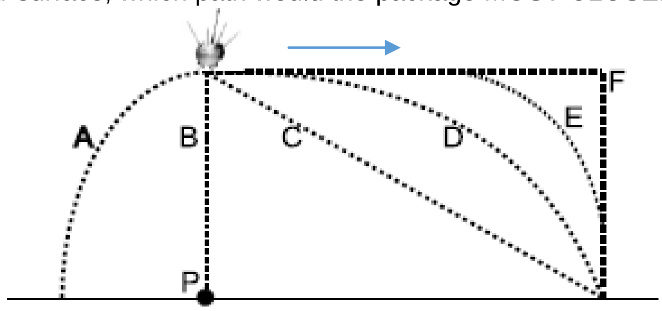
A. increase the launch angle and increase the ball's initial speed
B. increase the launch angle and decrease the ball's initial speed
C. decrease the launch angle and increase the ball's initial speed
D. decrease the launch angle and decrease the ball's initial speed

23. Four identical projectiles are launched with the same initial speed, *v*, but at various angles above the level ground. Which diagram represents the initial velocity of the projectile that will have the LARGEST total horizontal displacement? Neglect air resistance.

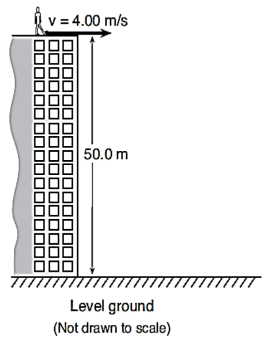


A B C D

24. A NASA probe moving horizontally above the moon's surface at constant speed, as shown in the diagram, releases an instrument package when it is directly above point P. As seen from the lunar surface, which path would the package MOST CLOSELY follow after release?



25. As shown in the diagram below, a student standing on the roof of a 50.0-meter-high building kicks a stone at a horizontal speed of 4.00 meters per second.



How much time is required for the stone to reach the level ground below? Neglect friction.

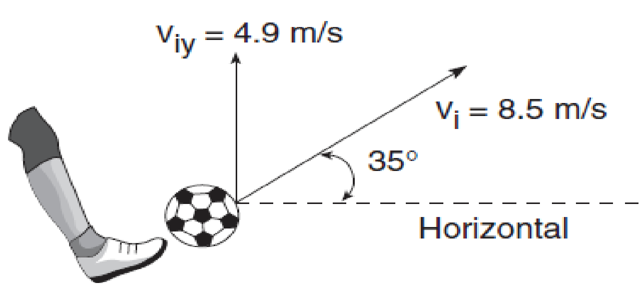
A. 3.19 s B. 5.10 s C. 10.2 s D. 12.5 s

26. Consider a projectile fired at 30° from the horizontal. The initial velocity of the projectile is 200 m/s. What is the time of flight? Neglect air friction.

A. 8 s B. 10.2 s C. 16 s D. 20.4 s

For questions 27 and 28 refer to the information and diagram below.

A child kicks a ball with an initial velocity of 8.5 meters per second at an angle of 35º with the horizontal, as shown. The ball has an initial vertical velocity of 4.9 meters per second and a total time of flight of 1.0 second. Neglect air resistance.



27. The horizontal component of the ball's initial velocity is approximately ______.

A. 3.6 m/s B. 4.9 m/s C. 7.0 m/s D. 13 m/s

28. The maximum height reached by the ball is approximately ______.

A. 1.2 m B. 2.5 m C. 4.9 m D. 8.5 m

For questions 29 and 30 refer to the information below.

Projectile A is launched horizontally at a speed of 20 meters per second from the top of a cliff and strikes a level surface below, 3.0 seconds later. Projectile B is launched horizontally from the same location at a speed of 30 meters per second.

29. Approximately how high is the cliff?

A. 29 m B. 44 m C. 60 m D. 104 m

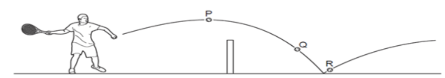
30. The time it takes projectile B to reach the level surface is ______.

A. 2.0 s B. 3.0 s C. 4.5 s D. 10 s

APPENDIX I

Table of Specifications: Physics Achievement Test and Summative Assessments

GRADE 10 ACHIEVEMENT TEST IN PHYSICS

<table>
<tr><th colspan="2">LEARNING COMPETENCIES</th><th>Time Spent on Topic (Days)</th><th>Percent of Class Time on Topic</th><th>LOTS</th><th>HOTS</th><th>Number of Test Items: 30</th><th>SAMPLE ITEMS</th></tr>
<tr><td colspan="8">TOPIC: <u>UAM - HORIZONTAL MOTION</u></td></tr>
<tr><td>1</td><td>Explain the conditions when a body is considered to be uniformly accelerating.</td><td>3</td><td>15%</td><td>1, 3, 5</td><td>2, 4</td><td>4.5 (5)</td><td>3. A tennis player hits a ball over the net.


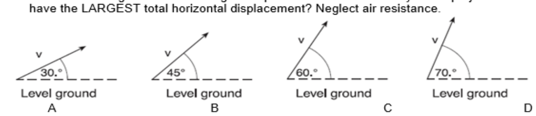
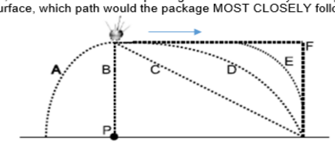
In which positions is the ball accelerating?
A. P and Q only
B. P and R only
C. Q and R only
D. P, Q and R

4. Which of the following shows uniformly accelerated motion?
A. a typhoon moving at 10 km/h North of East
B. a car moving without changing its speed along a straight line
C. a stone thrown upwards decreasing its speed by 10 m/s every second
D. a car increasing its speed from rest to 10 m/s after 1 second and speeding up even faster to a speed of 30 m/s in the next second</td></tr>
<tr><td>2</td><td>Solve, using numerical analysis, mathematical problems that involve uniformly accelerated motion.</td><td>4</td><td>20%</td><td></td><td>6, 7, 8, 9, 10, 11</td><td>6</td><td>10. A car travelling at 25.3 m/s approaches to stop for a restaurant ahead. If the driver slams on the brakes with an acceleration of -6.40 m/s^2, what will be his stopping distance?
A. 14.0 m B. 29.0 m C. 50.0 m D. 100.0 m

11. Rank the following objects according to the magnitude of the acceleration, from LEAST to GREATEST.
1. a car accelerating from 20 m/s to rest in 1.0 s.
2. a jogger accelerating from 2.0 m/s to 1.0 m/s in 8.3 s.
3. a falling fruit accelerating from 0.50 m/s to 10.3 m/s in 1.0 s.
4. while being hit, a golf ball accelerating from rest to 4.3 m/s in 0.40 s.

A. 1 – 3 – 2 – 4
B. 2 – 4 – 1 – 3
C. 1 – 4 – 3 – 2
D. 2 – 3 – 4 – 1</td></tr>
<tr><td colspan="8">TOPIC: <u>UAM - VERTICAL MOTION</u></td></tr>
<tr><td>1</td><td>Explain the conditions when a body is considered to be freely falling.</td><td>3</td><td>15%</td><td>12, 13, 15</td><td>14,</td><td>4.5 (4)</td><td>13. A piece of flat white paper is dropped and falls to the floor. The same piece of paper is then crumpled into a ball and dropped again. Which of the following will change in the second situation?
A. the weight of the paper
B. the initial acceleration when dropped
C. the time taken to reach terminal velocity
D. the maximum magnitude of the air resistance

14. Two stones of different weights were released at the same time from a table. What will happen and why? Air resistance may be ignored.
<table>
<tr><th></th><th>what will happen</th><th>why</th></tr>
<tr><td>A</td><td>both stones hit the floor at the same time</td><td>the acceleration of free fall is constant</td></tr>
<tr><td>B</td><td>both stones hit the floor at the same time</td><td>they fall at constant speed</td></tr>
<tr><td>C</td><td>the heavier stone hits the floor first</td><td>acceleration increases with weight</td></tr>
<tr><td>D</td><td>the heavier stone hits the floor first</td><td>speed increases with weight</td></tr>
</table></td></tr>
</table>

2	Solve, using numerical analysis, mathematical problems that involve free fall motion.	3	15%		16, 17, 18, 19	4.5 (4)	18. A ball thrown vertically upward reaches a maximum height of 30 meters above the surface of Earth. At its maximum height, the speed of the ball is _____. A. 0.0 m/s B. 3.1 m/s C. 9.8 m/s D. 24 m/s 19. A ball dropped from rest falls freely until it hits the ground with a speed of 20 meters per second. The time during which the ball is in free fall is approximately _____. A. 0.5 s B. 1 s C. 2 s D. 10 s
TOPIC: <u>PROJECTILE MOTION</u>							
1	Describe the horizontal and vertical motions of a projectile.	3	15%	23, 24	20, 21, 22	4.5 (5)	23. Four identical projectiles are launched with the same initial speed, *v*, but at various angles above the level ground. Which diagram represents the initial velocity of the projectile that will have the LARGEST total horizontal displacement? Neglect air resistance.  24. A NASA probe moving horizontally above the moon's surface at constant speed, as shown in the diagram, releases an instrument package when it is directly above point P. As seen from the lunar surface, which path would the package MOST CLOSELY follow after release? 
2	Investigate the relationship between the angle of release and the height and range of the projectile.	4	20%		25, 26, 27, 28, 29, 30	6	**For questions 29 and 30 refer to the information below.** Projectile A is launched horizontally at a speed of 20 meters per second from the top of a cliff and strikes a level surface below, 3.0 seconds later. Projectile B is launched horizontally from the same location at a speed of 30 meters per second. 29. Approximately how high is the cliff? A. 29 m B. 44 m C. 60 m D. 104 m 30. The time it takes projectile B to reach the level surface is _____. A. 2.0 s B. 3.0 s C. 4.5 s D. 10 s
	TOTAL	20	100 %	7	23	30	

SUMMATIVE ASSESSMENT NO. 1 – UNIFORMLY ACCELERATED MOTION

	LEARNING COMPETENCIES	Time Spent on Topic (Days)	Percent of Class Time on Topic	LOTS	HOTS	Number of Test Items: 31
1	Describe the motion of an accelerating body.	2	15 %	K1 K2 K3 K4	U	4.65 (5)
2	Analyze situations and relate variables involving bodies that are accelerating.	1	8 %		U	2.48 (2)
3	Use the acceleration formula in solving for the variables: acceleration, initial velocity and final velocity.	3	23 %	K8	P1ab P2c	7.12 (8)
4	Derive the appropriate equation when solving for the missing variable in the kinematic equations.	1	8 %		P1ab	2.48 (2)
5	Describe the motion of a freely falling body.	1	8 %	K5 K6	U	2.48 (2)
6	Analyze situations and relate variables involving bodies that are freely falling.	1	8 %	K7	U	2.48 (2)
7	Use the kinematic equations in solving for the variables: displacement, acceleration, time, initial velocity and final velocity.	2	15 %		P1 P2c	4.65 (5)
8	Derive the appropriate equation when solving for the missing variable in the kinematic equations.	2	15 %		P2ab	4.65 (5)
	TOTAL	13	100 %	8	23	31

SUMMATIVE ASSESSMENT NO. 2 – PROJECTILE MOTION

	LEARNING COMPETENCIES	Time Spent on Topic (Days)	Percent of Class Time on Topic	LOTS	HOTS	Number of Test Items: 30
1	Describe the horizontal and vertical motions of a projectile.	2	29 %	K1 K2 K5 K6	U	8.7 (9)
2	Investigate the relationship between the angle of release and the height and range of the projectile.	2	29 %	K7	P1ab P2abc	8.7 (9)
3	Compute for the vertical and horizontal distances traveled by a projectile, given its initial velocity.	2	29 %			8.7 (9)
4	Analyze situations and relate variables involving a projectile.	1	13 %	K3 K4	U	3.9 (3)
	TOTAL	7	100 %	7	23	30

APPENDIX J

Letter of Permission: School Principal

Br. Bernard S. Oca, FSC
School President and Principal
De La Salle Santiago Zobel School
Ayala Alabang, Muntinlupa City

Dear Brother Bernie Oca:

Good day and peace be with you!

The undersigned is currently conducting a thesis focusing on the effectiveness of using Gooru as a Learning Management System in classroom instructions and its effects on students' learning experiences in Physics. This study will be conducted at De La Salle Santiago Zobel School, Ayala Alabang Village, Muntinlupa City during the Term 1 of S.Y. 2016 – 2017. It will take about four (4) weeks of study period.

In view of this, the undersigned would like to request from your good office the permission to implement the research procedures using three (3) sections of Grade 10 students as respondents. Rest assured the confidentiality of the data gathered from the students will be given the most priority. The researcher is much willing to share the results of the study in any school-based research forum. Attached is the topic outline to be used in the said study.

I hope for your positive response on this matter. Thank you very much and God bless us all!

In St. La Salle,

Mr. Salvador John M. Magalong
Grade 10 – Physics Teacher

Noted by:

Prof. Brando C. Palomar
Thesis Adviser

Recommending Approval:

Mr. Richard T. Lasap
High School – Science Coordinator

Ms. Agnes B. Panaligan
High School Vice Principal for Academics

Approved by:

Br. Bernard S. Oca, FSC
School President and Principal, De La Salle Santiago Zobel School

APPENDIX K

Letter of Permission: Students

Dear Student,

The undersigned is currently conducting a thesis focusing on the effectiveness of using Gooru as a Learning Management System in classroom instructions and its effects on students' learning experiences in Physics. You are invited to participate in this study which is designed to help develop your self-regulation learning skills in studying Physics concepts using Gooru as a Learning Management System. This study will be conducted over a 4-week period in our subject. Your participation is completely voluntary, however, by participating you will enable us to better understand the effectiveness of technology by using a Learning Management System to promote effective learning strategies, and you will also gain an insight into educational research and inquiry, which could be useful for your own study habits and attitudes on the use of technology.

You are free to decide if you want to participate or not, and you can decline your participation at any time. If you do decide to stop participating, any information you may have provided will not be used. In any case, all your personal details will be deleted at the end of the study and will not be shared with other organizations or individuals. All data collected will only be used for the purposes of this study and you will not be identified in any reporting of the findings. Your decision to participate or not will have no adverse effects on you in your treatment and assessment in Physics.

Thank you very much and God bless us all!

In St. La Salle,

Mr. Salvador John M. Magalong
Grade 10 – Physics Teacher

Noted by:

Prof. Brando C. Palomar
Thesis Adviser

Recommending Approval:

Mr. Richard T. Lasap
High School – Science Coordinator

Ms. Agnes B. Panaligan
High School Vice Principal for Academics

Approved by:

Br. Bernard S. Oca, FSC
School President and Principal, De La Salle Santiago Zobel School

-- **REPLY SLIP** --

(To be returned on or before June 12, 2016)

Dear Mr. Magalong,

☐ Yes, I am willing to be part of the research respondents of your study. I understand that my participation in this study is voluntary and that I am free to refuse to participate. I am also aware that I am free to withdraw my participation in this study at any time. My refusal to participate or withdrawal of consent will not affect my performance in Physics.

☐ No, I am not willing to participate.

____ Student's Signature over Printed Name

____________________ Date

APPENDIX L

Letter of Permission: Parents

Dear Mr. and Mrs. ____________,

Good day and peace be with you!

The undersigned is currently conducting a thesis focusing on the effectiveness of using Gooru as a Learning Management System in classroom instructions and its effects on students' learning experiences in Physics. This study will be conducted at De La Salle Santiago Zobel School, Ayala Alabang Village, Muntinlupa City during the Term 1 of S.Y. 2016 – 2017. It will take about four (4) weeks of study period.

In view of this, the undersigned would like to request your permission to allow your child to be one of the respondents of the study. Your child's participation is completely voluntary, however, by participating, your child will be able to better understand the effectiveness of technology by using a Learning Management System to promote effective learning strategies, and your son/daughter will also gain an insight into educational research and inquiry, which could be useful for your child's own study habits and attitudes on the use of technology. All data collected will only be used for the purposes of this study and your child will not be identified in any reporting of the findings. Your decision to let your child participate or not will have no adverse effects on his/her performance in Physics.

Thank you very much and God bless us all!

In St. La Salle,

Mr. Salvador John M. Magalong
Grade 10 – Physics Teacher

Noted by:

Prof. Brando C. Palomar
Thesis Adviser

Recommending Approval:

Mr. Richard T. Lasap
High School – Science Coordinator

Ms. Agnes B. Panaligan
High School Vice Principal for Academics

Approved by:

Br. Bernard S. Oca, FSC
School President and Principal, De La Salle Santiago Zobel School

-- **REPLY SLIP** --

(To be returned on or before June 13, 2016)

Dear Mr. Magalong,

☐ I have read the details of your letter and I hereby allow my son/daughter ______________________ of section ________________ to be a respondent of your study. We are aware of the benefits that our son/daughter will derive from his/her participation in this activity and the diligence to be exercised by you thereof to ensure his/her safety during the conduct of the study. We are also expected to make sure that our child does his/her required work at home.

☐ No, I am not allowing our child to participate in your study because _________________________.

____________________________________ ________________
Parent's Signature over Printed Name Date

APPENDIX M

Communication Letter for the Evaluation of the Learning Plans and Assessments

[Name]
Designation
Institution

Dear Sir/Madam:

Good day and peace be with you!

The undersigned is currently conducting a thesis focusing on the effectiveness of using Gooru as a Learning Management System in classroom instructions and its effects on students learning experiences in Physics.

In view of this, the undersigned would like to request for your expertise to examine and to validate the learning plans and assessments that will be used in this study. Attached with this letter are the developed learning plans, assessments with answer keys and the evaluation tool for the validation procedure. Your evaluation and comments to the materials are highly appreciated as to realize the objectives of the said academic endeavor.

Thank you in advance for your positive response on this matter and for sharing your time and expertise. God bless us all!

Respectfully Yours,

Mr. Salvador John M. Magalong
M.A. Science Education – Physics
PNU - Manila

Noted by:

Prof. Brando C. Palomar
Thesis Adviser

APPENDIX N

Communication Letter for the Evaluation of the Physics Achievement Test

[Name]
Designation
Institution

Dear Sir/Madam:

Good day and peace be with you!

The undersigned is currently conducting a thesis focusing on the effectiveness of using Gooru as a Learning Management System in classroom instructions and its effects on students learning experiences in Physics.

In view of this, the undersigned would like to request for your expertise to examine and to validate the teacher made physics achievement test that will be used in this study. Attached with this letter are the developed achievement test with answer key and the evaluation tool for the validation procedure. Your evaluation and comments to the materials are highly appreciated as to realize the objectives of the said academic endeavor.

Thank you in advance for your positive response on this matter and for sharing your time and expertise. God bless us all!

Respectfully Yours,

Mr. Salvador John M. Magalong
M.A. Science Education – Physics
PNU - Manila

Noted by:

Prof. Brando C. Palomar
Thesis Adviser

APPENDIX O

Communication Letter for the Evaluation of the Reflective Journal Template and Post Individual Interview Questionnaire

[Name]
Designation
Institution

Dear Sir/Madam:

Good day and peace be with you!

The undersigned is currently conducting a thesis focusing on the effectiveness of using Gooru as a Learning Management System in classroom instructions and its effects on students learning experiences in Physics.

In view of this, the undersigned would like to request for your expertise to examine and to validate the reflective journal that will be used in this study. Attached with this letter are the developed reflective journal template and the evaluation tool for the validation procedure. Your evaluation and comments to the materials are highly appreciated as to realize the objectives of the said academic endeavor.

Thank you in advance for your positive response on this matter and for sharing your time and expertise. God bless us all!

Respectfully Yours,

Mr. Salvador John M. Magalong
M.A. Science Education – Physics
PNU - Manila

Noted by:

Prof. Brando C. Palomar
Thesis Adviser

APPENDIX P

Physics Topic Outline

DE LA SALLE SANTIAGO ZOBEL SCHOOL - HIGH SCHOOL DEPARTMENT
COURSE OUTLINE FOR PHYSICS: SY 2016-2017

FIRST TERM	SECOND TERM	THIRD TERM
UNIT 1: MECHANICS I **A. MOTION ALONG A STRAIGHT LINE** 1. Horizontal Motion 1.1 Physical Quantities: Scalars and Vectors 1.2 Distance and Displacement 1.3 Speed and Velocity 1.4 Acceleration 2. Uniformly Accelerated Motion 2.1 Horizontal Motion 2.2 Vertical Motion (Freely Falling Bodies) **B. MOTION ALONG A CURVED PATH** 1. Resolution of Vectors 2. Projectile Motion 2.1 Horizontally Launched Projectiles 2.2 Projectile Launched at an Angle 3. Graphical Analysis of Motion **UNIT 2: MECHANICS II** **A. FORCES** 1. Nature of Forces 1.1 Contact and Field Forces 1.2 The Free-Body Diagram and Net Force **B. NEWTON'S LAWS OF MOTION** 1. Newton's First Law - Law of Inertia 1.1 Inertia at Rest 1.2 Inertia in Motion - Momentum 2. Newton's Second Law - Law of Acceleration 2.1 Force, Mass and Acceleration relationships 2.2 Impulse and Momentum Theorem 3. Newton's Third Law – Law of Interaction 3.1 Identifying Action and Reaction Forces 3.2 The Law of Conservation of Momentum 4. Uniform Circular Motion 4.1 Centripetal Acceleration 4.2 Centripetal and Centrifugal Force	**UNIT 1: WORK, POWER and ENERGY** **A. WORK AND POWER** 1. Work 1.1 Scientific Concept of Work 1.2 Calculating the amount of Work 1.3 Work and Power 1.4 Power and Velocity **B. WORK AND ENERGY** 1. Energy and its many forms 2. Energy – Work Transformation 2.1 Kinetic and Potential Energy 2.2 Work – Energy Theorem 2.3 Law of Conservation of Energy **UNIT 2: HEAT AND TEMPERATURE** **A. HEAT AND TEMPERATURE** 1. Thermal Energy vs Internal Energy 2. Heat vs. Temperature 3. Measuring Heat 4. Heat and Specific Heat Capacity **B. EFFECTS OF HEAT** 1. Modes of Heat Transfer 1.1 Conduction, Convection and Radiation 2. Thermal Expansion 3. Phase Changes **C. THERMAL EQUILIBRIUM** 1. Principle of Heat Exchange 2. Calorimetry	**UNIT 1: WAVE MOTION** **A. WAVE CONCEPT** 1. Types of Waves 1.1 Transverse and Longitudinal Waves 1.2 Mechanical and Electromagnetic Waves 2. Characteristics of Waves 2.1 Amplitude, Wavelength, Frequency 3. Wave Velocity **B. SOUND WAVES** 1. Nature and Characteristics of Sound 1.1 Pitch, Loudness, Quality 2. Speed of Sound at Varying Temperature **C. LIGHT WAVES** 1. Nature and Characteristics of Light 1.1 Intensity or Brightness 1.2 The EM Spectrum 2. Properties of the Visible Light 2.1 Reflection, Refraction, Diffraction, Interference 2.2 Colors 3. Mirrors and Lenses 3.1 Reflection of Light in Mirrors 3.2 Refraction of Light in Lenses **UNIT 2: ELECTRICITY AND MAGNETISM** **A. ELECTRICITY** 1. Charges and Charging Processes 2. Home Circuitry 3.1 Ohm's Law 3.2 Electrical Power and Electrical Energy 3.3 Series and Parallel Connection 3.4 Safety Devices at home **B. ELECTRICITY AND MAGNETISM** 1. Power Generation and Energy Losses 2. Transmission and Distribution of Electrical Energy. 3. Electromagnetic Effects 3.1 Electromagnetic Induction 3.2 Electric Motor and Generator

APPENDIX Q

Physics Experts' and Teachers' Evaluation on the Learning Plans and Assessments

Assessment on the Level of Acceptability of Learning Plans and Assessments

A. The **OVERALL PLAN**:

1. is written in a clear and understandable manner.
2. can be carried out in an actual school situation.
3. is geared to the level of the students’ maturity and abilities.
4. includes the use of supportive or illustrative audio or visual aids.
5. contains the necessary parts of a learning plan of a flipped based instruction.

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1		×					×					×			
2		×				×					×				
3		×				×					×				
4	×							×			×				
5	×					×					×				

B. The **CONTENT:**

1. is sufficient and appropriate to the level of the students’ maturity and abilities.
2. is properly aligned to the learning competencies intended for the students’ grade level.
3. includes information necessary for the achievement of the stated objectives.
4. includes all the essential parts of a NxGBL learning module.

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1		×				×					×				
2		×				×					×				
3	×					×					×				
4	×					×					×				

C. The **OBJECTIVES**:

1. are stated to meet both the expected content and performance standards.
2. are clear, concise, and easily understood
3. are designed to support identified student “outcomes” for the entire physics subject as stated in the physics topic outline
4. are appropriately aligned to the developed formative and summative assessments.

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1		×				×					×				
2	×						×				×				
3		×				×					×				
4	×					×					×				

D. The **LESSON PROCEDURE**:

1. provides teacher and students logical orientation of the flow of the topic presentation.
2. emphasizes the active participation of students in the presentation of the lesson.
3. indicates clearly activities to be done in class and at home
4. explains the use of the Gooru Learning effectively in terms of methods, techniques, and learning experiences appropriate to the lesson objectives.
5. follows the design features of a flipped based learning.
6. provides students with opportunities to become actively engaged in the learning process.
7. is designed to meet student needs, interests, and abilities through the use of Gooru learning.

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1	×					×						×			
2	×						×					×			
3	×					×						×			
4		×				×						×			
5	×					×					×				
6		×				×					×				
7		×				×					×				

E. The **ASSESSMENT TOOLS**:															
1. allows the students to draw conclusions consistent with the objectives of the lesson.															
2. allows students to actively participate in summarizing what they have learned.															
3. have varied designs/features to measure students' understanding.															
4. are appropriately aligned to the lesson objectives.															
5. are appropriate to the level of students' maturity and abilities.															
Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1		×				×					×				
2	×					×					×				
3	×					×					×				
4		×				×					×				
5		×				×					×				

F. The **ACTIVITIES**:															
1. are aligned with the stated objectives															
2. are properly designed to support the scaffolding/incremental process leading to the desired students' outcomes for the lesson															
3. are varied to address student differences.															
4. are suited to the students' learning habits in class or at home.															
5. follow the design features of a flipped based learning.															
Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1		×				×					×				
2		×					×				×				
3		×				×						×			
4		×				×						×			
5	×					×						×			

<table>
<tr><td colspan="16">G. The LANGUAGE used:</td></tr>
<tr><td colspan="16">1. is easy to understand</td></tr>
<tr><td colspan="16">2. avoids too much technical terms</td></tr>
<tr><td colspan="16">3. is free of misspelled words</td></tr>
<tr><td colspan="16">4. is free of grammatical errors</td></tr>
<tr><td colspan="16">5. provides instructions that are easy to follow</td></tr>
<tr><td rowspan="2">Criteria</td><td colspan="5">A</td><td colspan="5">B</td><td colspan="5">C</td></tr>
<tr><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td>1</td><td>×</td><td></td><td></td><td></td><td></td><td>×</td><td></td><td></td><td></td><td></td><td></td><td>×</td><td></td><td></td><td></td></tr>
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<tr><td>5</td><td>×</td><td></td><td></td><td></td><td></td><td></td><td>×</td><td></td><td></td><td></td><td></td><td>×</td><td></td><td></td><td></td></tr>
</table>

APPENDIX R

Physics Experts' and Teachers' Evaluation on the Achievement Test

Assessment on the Level of Acceptability of the Achievement Test

A. The **QUESTIONS/ITEMS** of the developed-test:
1. are briefly and clearly stated
2. are measureable and attainable
3. are aligned to the set learning competencies in the TOS
4. are aligned to the levels of the Bloom's Taxonomy revealed in the TOS (LOTS and HOTS)
5. are substantial that contains facts to be recalled, table and diagram to be interpreted and problems to be solved.
6. are helpful in developing better conceptual understanding in Physics
7. are useful in eliciting common students' misconceptions
8. are helpful in improving students' critical thinking skills
9. are meaningful by itself and present a definite problem

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1	×					×					×				
2	×					×					×				
3	×					×					×				
4	×					×						×			
5	×					×					×				
6	×					×					×				
7		×				×					×				
8	×					×					×				
9	×					×					×				

B. The **OPTIONS/ALTERNATIVES** of the developed-test:
1. are briefly and clearly stated
2. are related and relevant to the questions
3. contain only one best answer
4. contain good numbers of distracters
5. contain distracters that are plausible and attractive
6. are arranged logically
7. are grammatically aligned with the question

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1	×					×					×				
2	×					×					×				
3	×					×					×				
4	×					×					×				
5	×					×					×				
6	×						×					×			
7	×					×					×				

C. The **LANGUAGE** used in the developed-test:

1. is easy to understand
2. avoids too much technical terms
3. is free of misspelled words
4. is free from grammatical errors
5. provides instructions that are easy to follow

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1	×					×					×				
2		×				×					×				
3	×						×				×				
4	×						×				×				
5	×					×					×				

D. The **LAYOUT** of the developed-test:

1. has a clear instruction and appealing layout
2. uses illustrations that help students build and develop clear scientific conceptions
3. uses illustrations that are creative and appealing to the respondents
4. shows readability of text
5. provides enough and appropriate space for the questions and options

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1	×					×					×				
2	×					×					×				
3	×					×					×				
4	×					×					×				
5	×					×					×				

APPENDIX S

Physics Experts' and Teachers' Evaluation on the Reflective Journal Template and Post Individual Interview Questionnaire

Assessment on the Level of Acceptability of the Reflective Journal and Post Individual Interview Questionnaire

A. The **QUESTIONS** of the developed reflective journal:

1. are briefly and clearly stated
2. are significant to the attainment of the objectives of the study
3. cover the students’ insights and experiences in the classroom
4. are relevant to the competencies to be learned by the Grade 10 students

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1			×				×					×			
2	×					×					×				
3	×					×					×				
4	×						×				×				

B. The **LANGUAGE** used in the developed journal activity log

1. is easy to comprehend
2. avoids too much technical terms
3. is within the context of the Filipino students
4. is free from misspelled words
5. is free from grammatical errors
6. provides instructions that are easy to follow

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1		×				×					×				
2		×				×					×				
3		×					×				×				
4		×				×					×				
5		×					×				×				
6		×				×					×				

C. The **LAYOUT** of the developed journal activity log:

1. has an appealing organization
2. uses layout that are creative and appealing to the respondents
3. shows readability of texts
4. provides enough and appropriate space for the answers

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1	×					×						×			
2	×					×						×			
3	×					×					×				
4	×					×					×				

D. The journal activity log is **USEFUL** in terms of:

1. ease of reproduction
2. ease of administering to students
3. probing students' interest, dynamics and behavior in the classroom experiences
4. using it as an assessment tool
5. making it a part of students' learning experiences

Criteria	A					B					C				
	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1	×					×					×				
2	×					×					×				
3	×					×						×			
4	×					×					×				
5	×					×					×				

APPENDIX T

Participants' Scores on Physics Achievement Test

PARTICIPANT	OVERALL		HORIZONTAL		VERTICAL		PROJECTILE	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
1	10	5	4	1	2	2	4	2
2	5	10	1	3	2	4	2	3
3	5	9	1	2	3	3	1	4
4	6	17	0	4	3	8	3	5
5	5	15	2	5	0	7	3	3
6	6	15	2	5	1	5	3	5
7	5	12	2	4	1	4	2	4
8	8	8	1	2	2	4	5	2
9	7	10	1	4	3	4	3	2
10	7	18	4	7	2	4	1	7
11	5	11	3	3	1	5	1	3
12	12	10	2	1	6	4	4	5
13	8	16	2	4	3	7	3	5
14	6	10	1	3	2	4	3	3
15	8	12	1	4	5	5	2	3
16	8	14	3	5	3	5	2	4
17	7	7	2	1	2	3	3	3
18	3	9	1	4	1	3	1	2
19	5	15	0	6	3	5	2	4
20	6	11	5	4	1	6	0	1
21	10	4	2	2	4	1	4	1
22	7	15	1	5	3	7	3	3
23	8	9	3	2	1	4	4	3
24	7	9	1	3	3	3	3	3
25	5	18	1	6	4	6	0	6
26	8	7	4	1	2	3	2	3
27	8	10	4	4	2	5	2	1
28	12	11	3	4	4	5	5	2
29	10	15	3	3	4	6	3	6
30	15	13	5	2	5	4	5	7
31	8	13	3	1	4	6	1	6
32	6	13	4	4	1	5	1	4
33	5	12	2	3	0	4	3	5
34	9	12	2	4	4	4	3	4
35	7	16	3	5	2	5	2	6
36	12	10	2	2	3	5	7	3
37	4	10	2	4	1	3	1	3
38	8	15	4	5	3	5	1	5
39	12	18	3	8	7	6	2	4

40	15	22	8	10	5	5	2	7
41	9	13	3	5	2	3	4	5
42	11	18	6	7	1	5	4	6
43	6	11	2	0	2	5	2	6
44	4	13	2	5	2	3	0	5
45	7	21	2	7	1	7	4	7
46	8	11	2	2	2	5	4	4
47	6	8	3	3	2	4	1	1
48	10	11	6	5	2	2	2	4
49	10	13	2	4	3	6	5	3
50	2	13	0	3	0	6	2	4
51	7	9	4	4	1	1	2	4
52	12	15	2	5	5	6	5	4
53	4	12	1	3	1	5	2	4
54	8	14	4	4	2	4	2	6
55	7	8	4	2	2	2	1	4
56	7	11	3	3	1	4	3	4
57	8	11	1	4	3	5	4	2
58	1	12	0	3	0	4	1	5
59	10	11	2	5	3	3	5	3
60	11	12	2	4	3	5	6	3
61	6	3	3	1	1	1	2	1
62	5	13	3	7	1	3	1	3
63	8	20	5	9	1	6	2	5
64	8	14	4	4	1	3	3	7
65	7	12	2	5	1	6	4	1
66	7	9	2	2	2	3	3	4
67	9	10	4	3	3	4	2	3
68	8	14	4	5	2	5	2	4
69	4	14	1	5	3	6	0	3
70	7	8	1	1	3	4	3	3
71	6	11	1	1	3	6	2	4
72	6	11	5	4	1	3	0	4
73	4	9	0	1	2	5	2	3
74	5	11	2	0	0	5	3	6
75	7	12	4	5	2	4	1	3
76	7	14	2	6	2	5	3	3
77	5	13	0	4	4	7	1	2
78	10	7	4	0	2	5	4	2
79	12	9	5	4	2	2	5	3
80	5	13	4	3	0	6	1	4

81	6	14	1	4	1	3	4	7
82	5	9	2	1	1	2	2	6
83	7	15	3	6	3	5	1	4
84	5	16	2	6	2	5	1	5
85	8	15	2	5	3	5	3	5
86	8	14	1	4	3	6	4	4
87	10	13	2	7	3	4	5	2
88	7	19	2	8	1	6	4	5
89	8	13	2	4	1	6	5	3
90	5	13	0	7	2	4	3	2
91	7	12	3	3	2	6	2	3
92	9	16	2	4	4	6	3	6
93	6	16	3	7	1	5	2	4
94	11	20	4	7	5	6	2	7
95	7	13	2	5	3	5	2	3
96	5	19	2	8	1	6	2	5
97	7	14	2	7	3	5	2	2
98	11	13	5	3	2	4	4	6
99	10	10	2	2	3	4	5	4
100	8	11	3	2	3	6	2	3
101	12	7	4	0	4	4	4	3
102	4	11	1	3	1	6	2	2

APPENDIX U

Statistical Treatments

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	POST	12.382	102	3.5350	.3500
	PRE	7.431	102	2.5775	.2552
Pair 2	POST	3.931	102	2.0884	.2068
	PRE	2.500	102	1.5008	.1486
Pair 3	POST	4.578	102	1.4242	.1410
	PRE	2.294	102	1.3686	.1355
Pair 4	POST	3.873	102	1.5712	.1556
	PRE	2.637	102	1.4474	.1433

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	POST & PRE	102	.064	.521
Pair 2	POST & PRE	102	.172	.084
Pair 3	POST & PRE	102	.156	.118
Pair 4	POST & PRE	102	-.068	.494

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	POST - PRE	4.9510	4.2389	.4197	4.1184	5.7836	11.796	101	.000
Pair 2	POST - PRE	1.4314	2.3526	.2329	.9693	1.8935	6.145	101	.000
Pair 3	POST - PRE	2.2843	1.8151	.1797	1.9278	2.6408	12.710	101	.000
Pair 4	POST - PRE	1.2353	2.2079	.2186	.8016	1.6690	5.651	101	.000

APPENDIX V

Reflective Journal Themes and Summary of Responses

Category	Code	CODES
PHYSICS PERFORMANCE	HELPFUL in UNDERSTANDING the TOPIC	
	SELF-PACED	
	DETAILED and SPECIFIC EXPLANATIONS	
INDEPENDENT STUDY SKILLS	INDEPENDENT LEARNER	
	SENSE of RESPONSIBILITY	
	TIME MANAGEMENT	
	DEVELOP RESEARCH SKILLS	
	DEVELOP INITIATIVE	
ATTITUDE on the USE of TECHNOLOGY	USEFUL	
	NEEDS for TEACHER's ASSISTANCE	
	INTERESTING/ENGAGING	
OTHERS	TECHNICAL DIFFICULTIES	
	PREFERENCE for PERSON-TEACHER	

SUMMARY of JOURNAL RESPONSES												
	HORIZONTAL MOTION			VERTICAL MOTION			PROJECTILE MOTION			OVERALL		
No.	Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3
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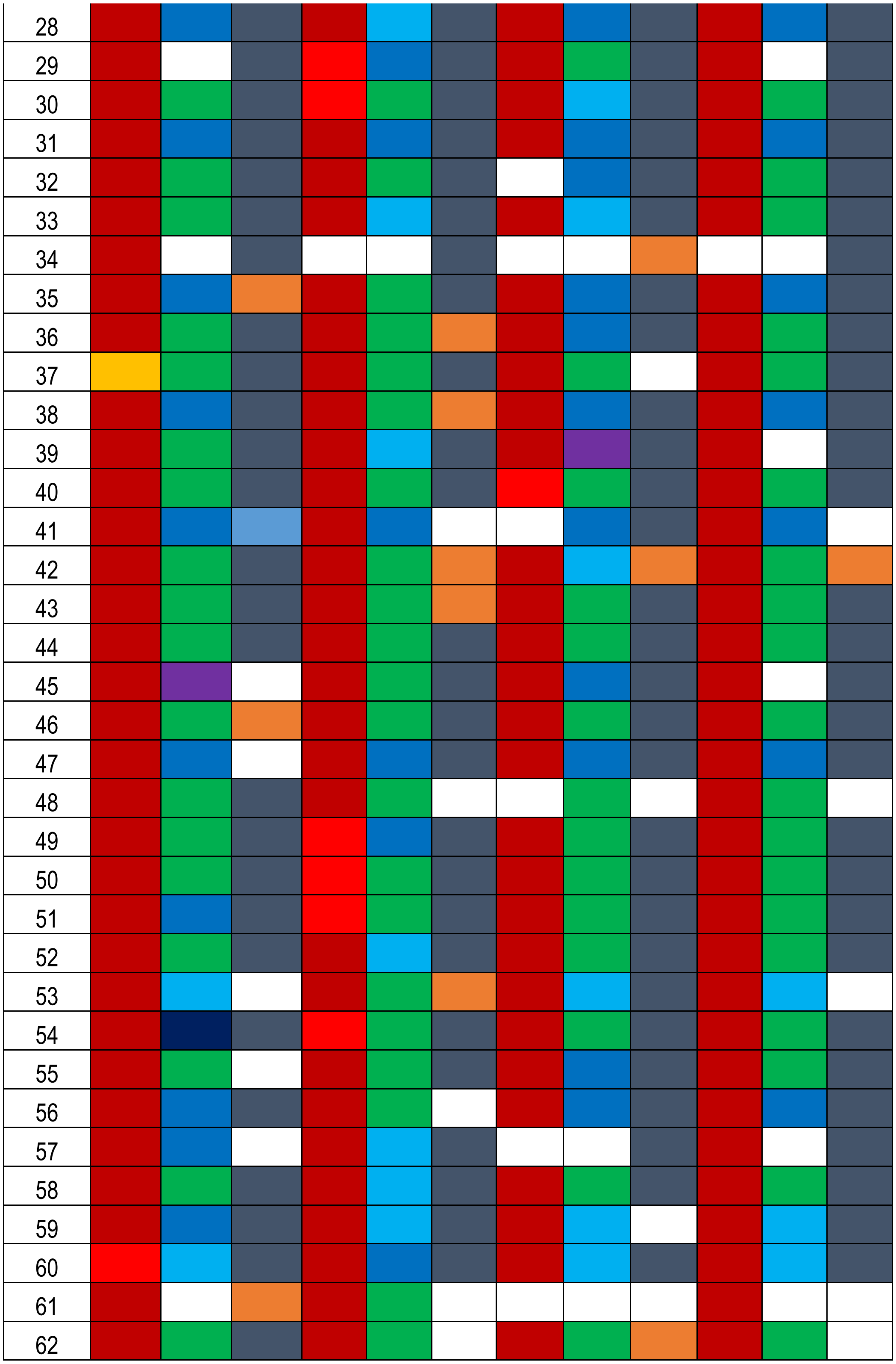
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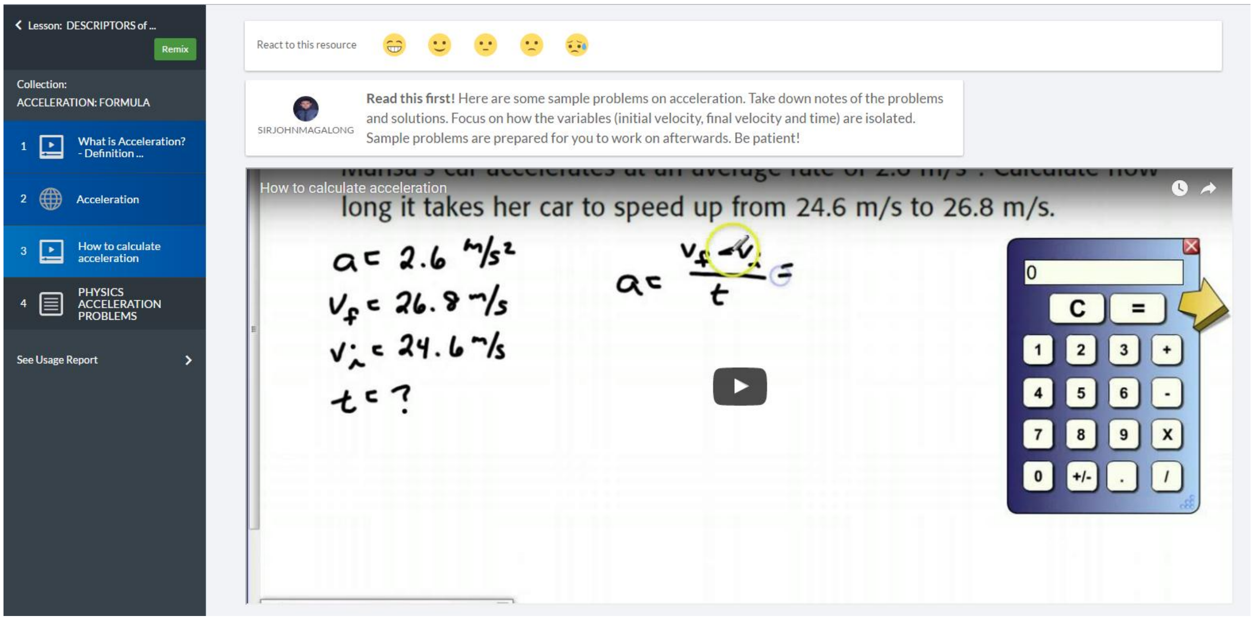
102												

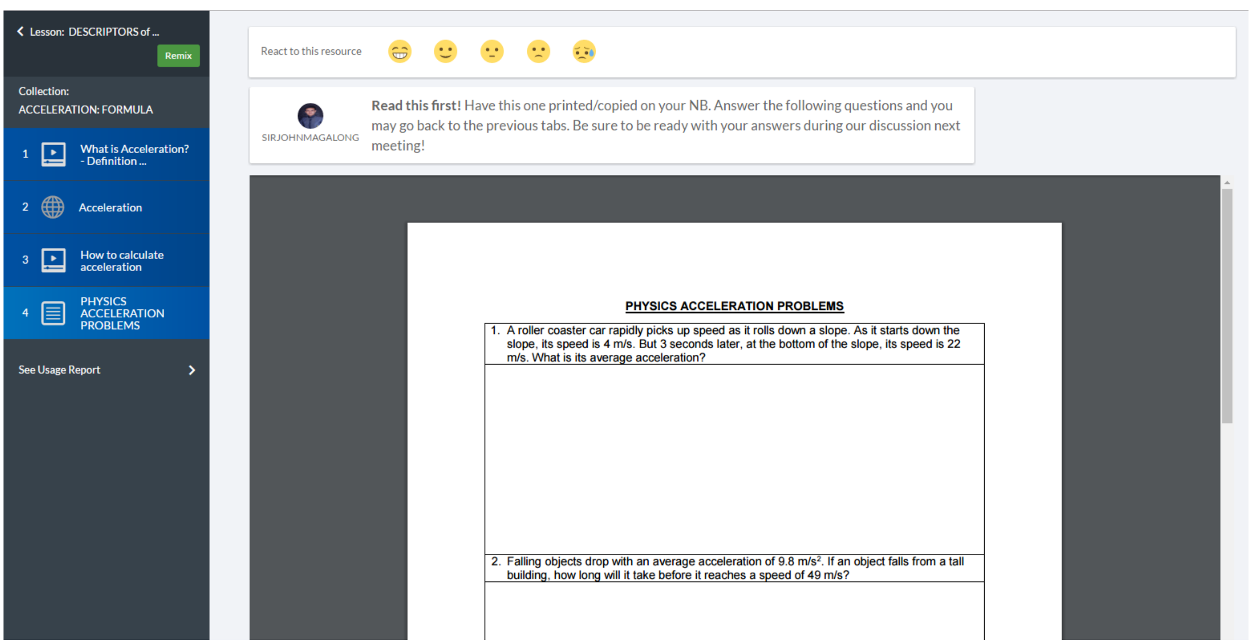
TALLY of RESPONSES																									
	HORIZONTAL MOTION			VERTICAL MOTION			PROJECTILE MOTION			OVERALL			TOTAL	HORIZONTAL MOTION			VERTICAL MOTION			PROJECTILE MOTION			OVERALL		
	Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3		Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3
	96			88			83			97			102	94.12			86.27			81.37			95.10		
	3			13			2			1			102	2.94			12.75			1.96			0.98		
	3			0			5			1			102	2.94			0.00			4.90			0.98		
NO FILL	0			1			12			3			102	0.00			0.98			11.76			2.94		
		55			54			42			47		102		53.92			52.94			41.18			46.08	
		4			17			19			9		102		3.92			16.67			18.63			8.82	
		29			23			29			25		102		28.43			22.55			28.43			24.51	
		4			1			3			1		102		3.92			0.98			2.94			0.98	
		4			6			3			4		102		3.92			5.88			2.94			3.92	
NO FILL		6			1			6			16		102		5.88			0.98			5.88			15.69	
			64			68			81			78	102			62.75			66.67			79.41			76.47
			8			4			2			3	102			7.84			3.92			1.96			2.94
			20			21			11			10	102			19.61			20.59			10.78			9.80
NO FILL			10			9			8			11	102			9.80			8.82			7.84			10.78

APPENDIX W

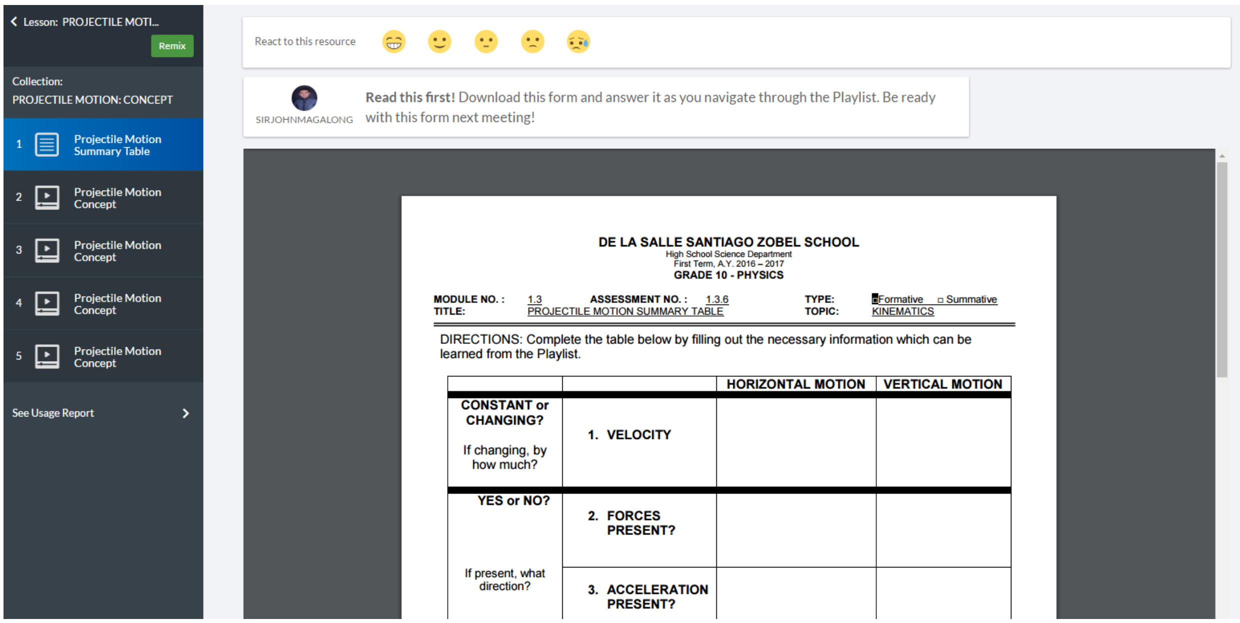
Sample Gooru Playlists

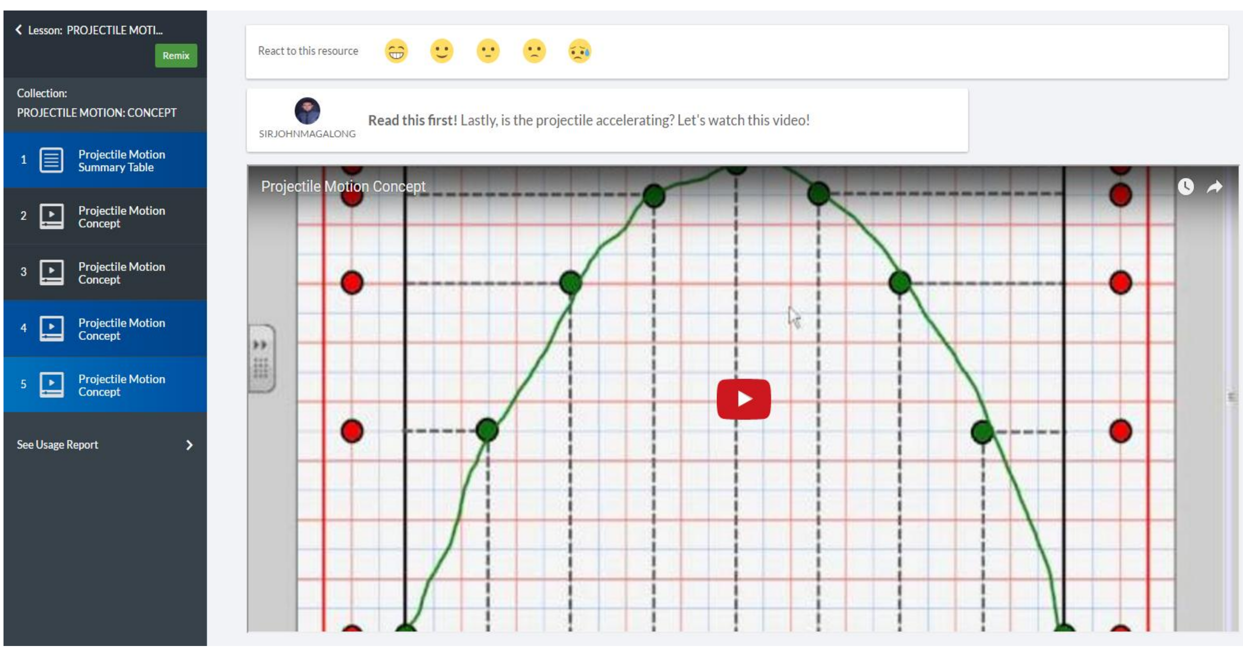
Playlist on Calculating Acceleration



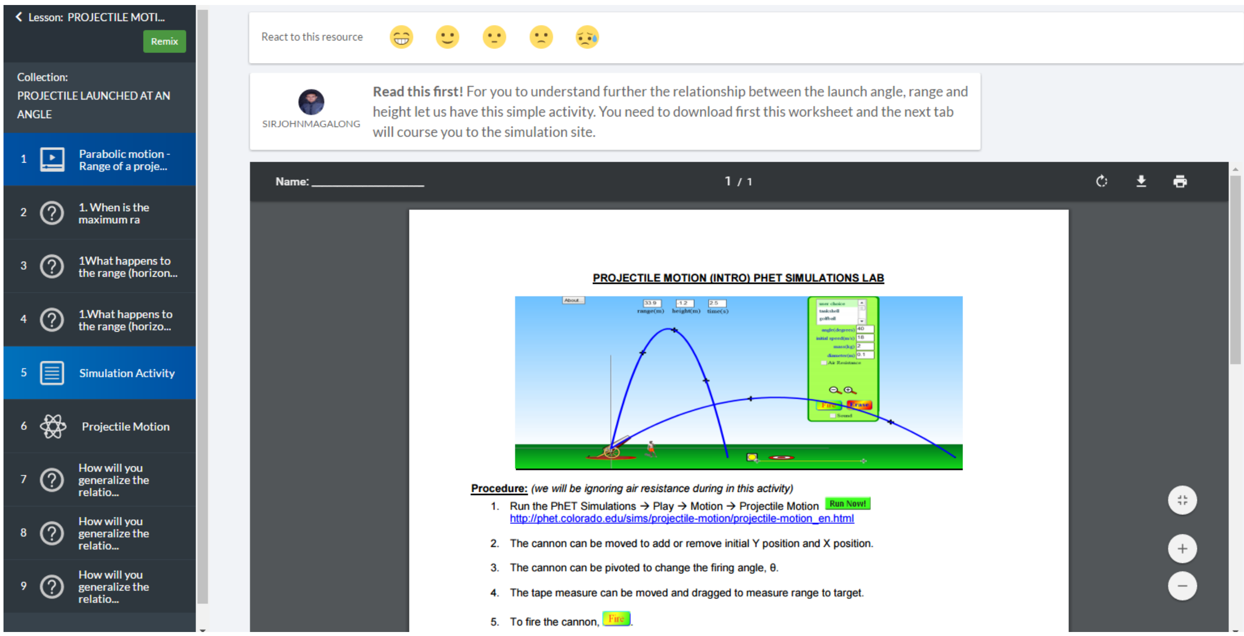


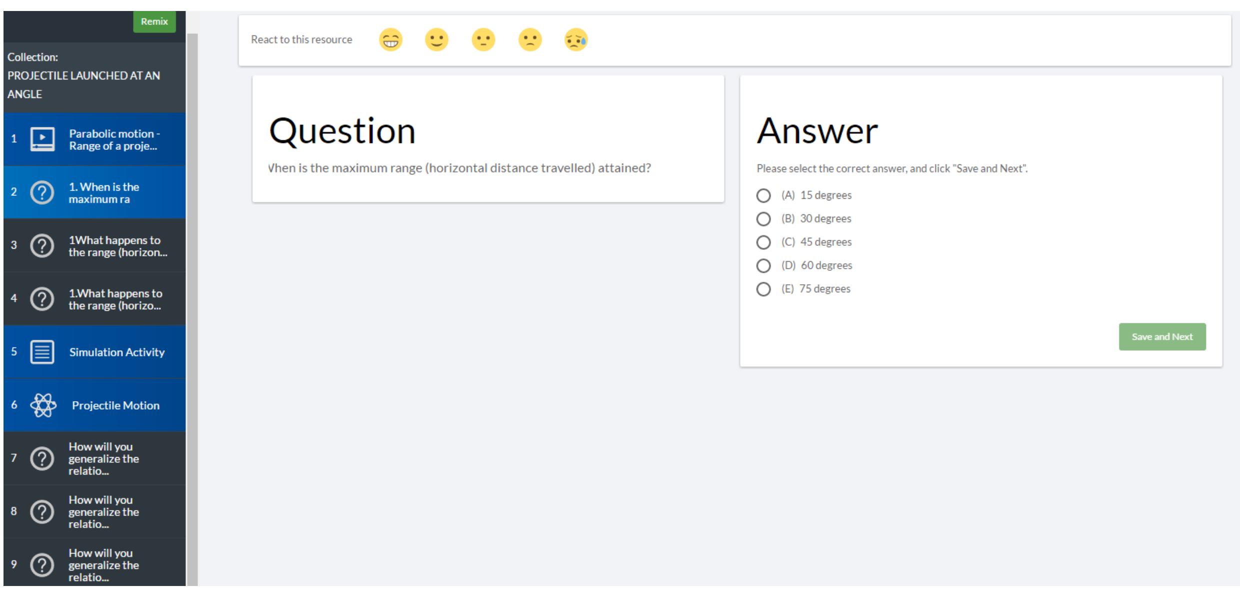
Playlist on Projectile Motion Concept





Playlist on Projectile Launched at an Angle





APPENDIX X

Documentation

Testing

10 G

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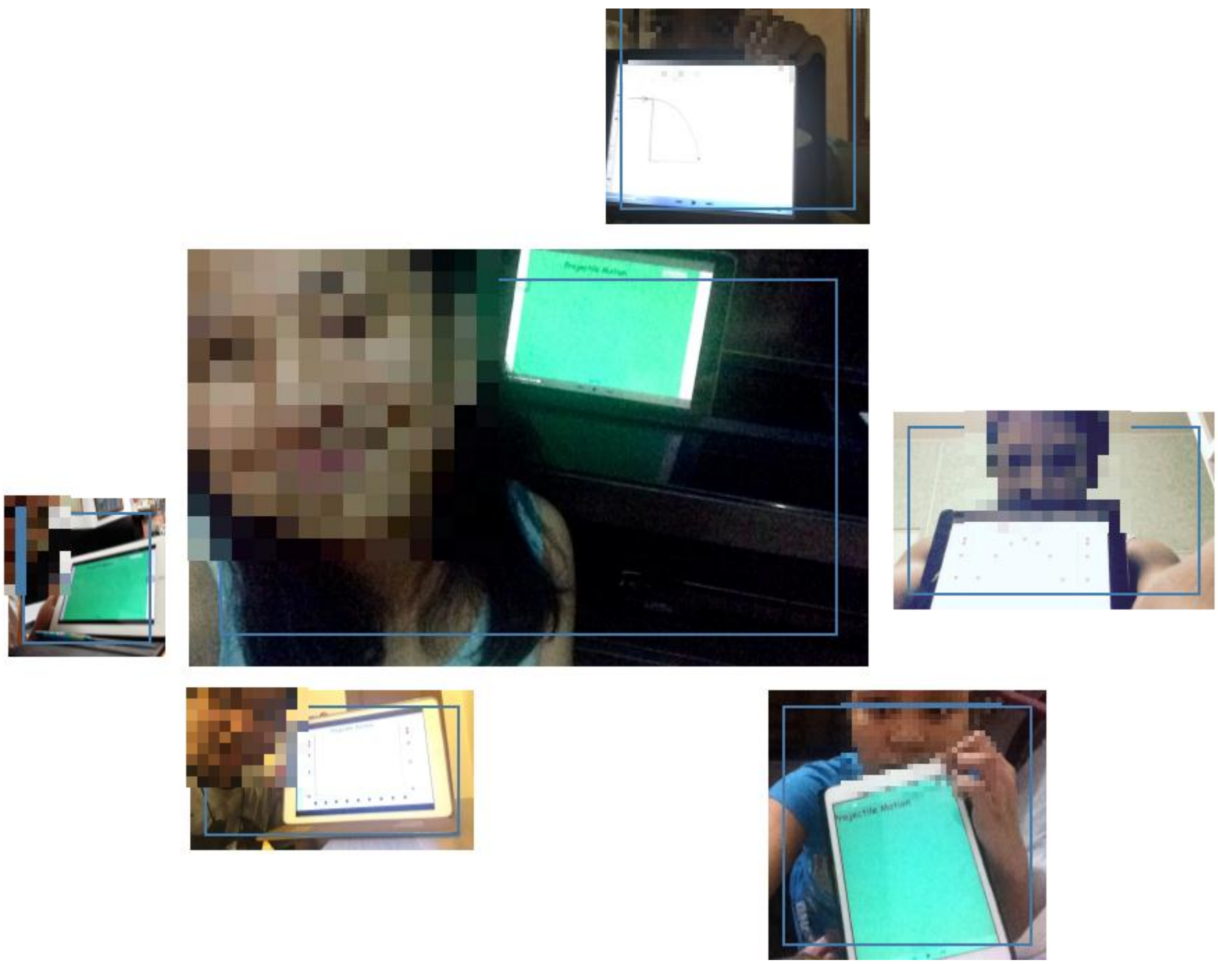
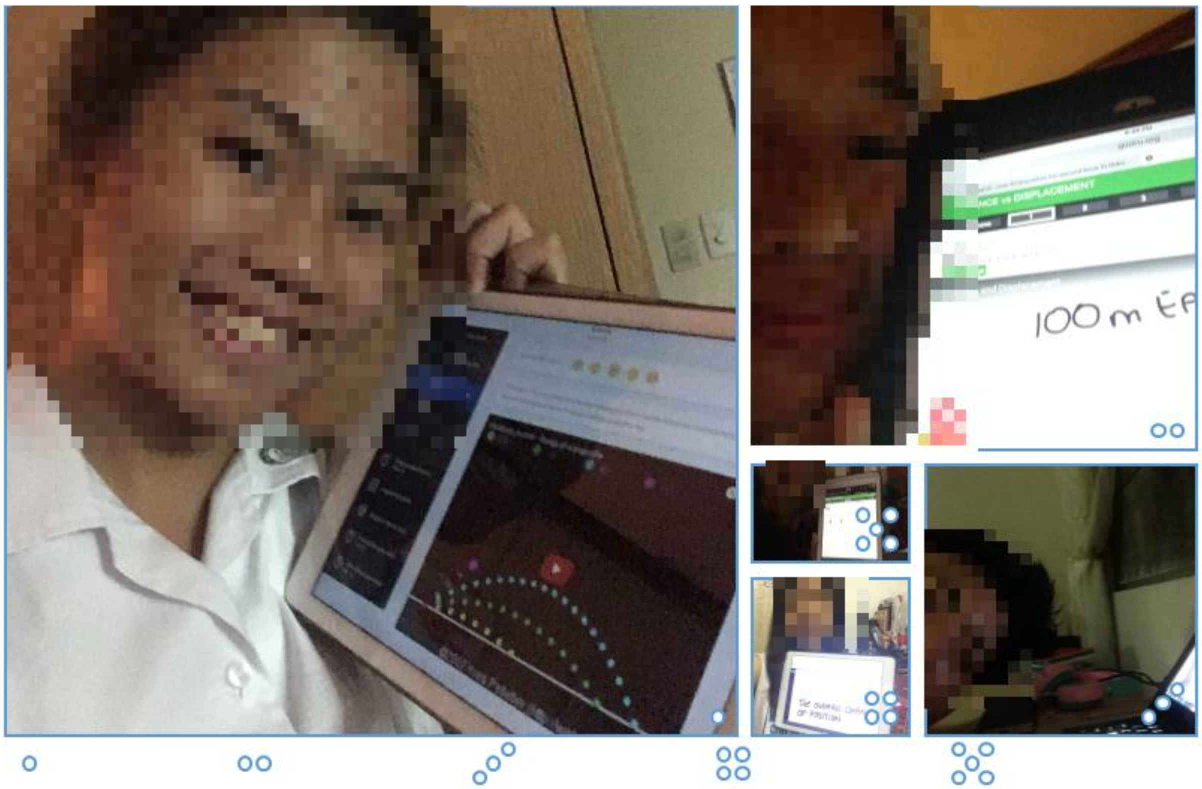
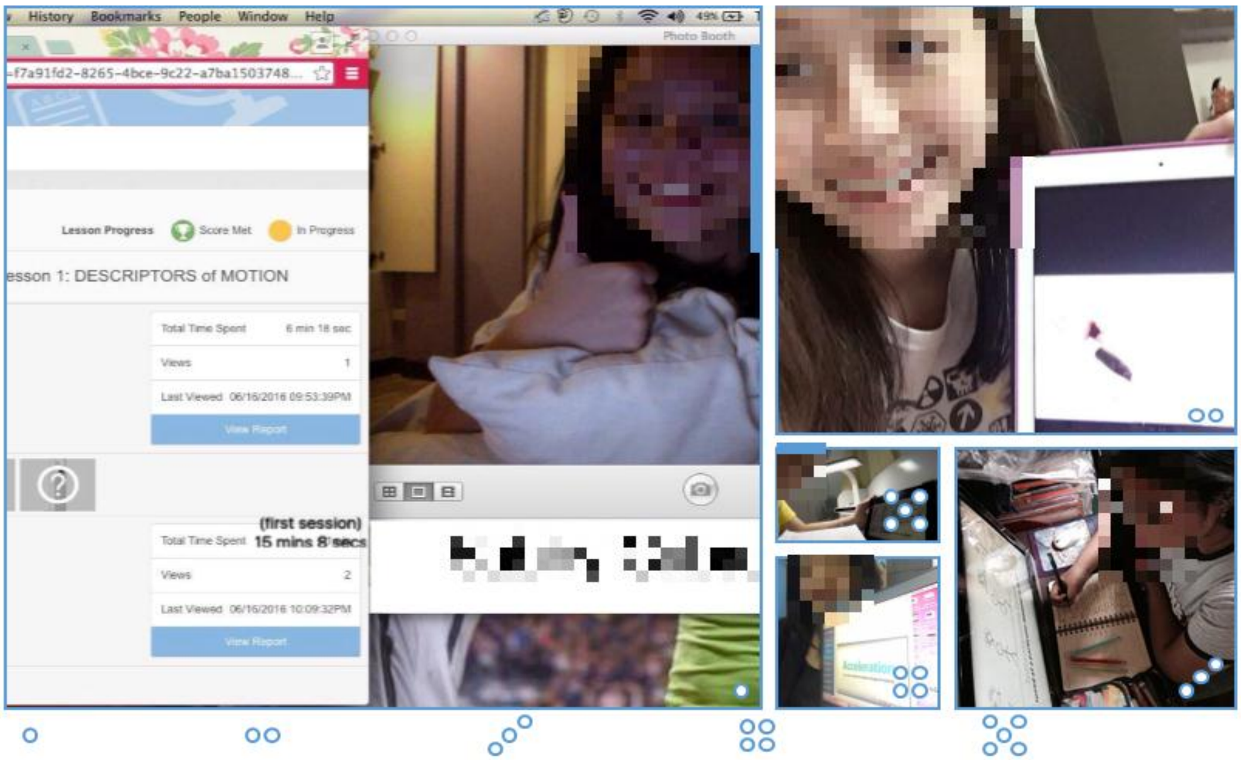
10 I

Using GLMS at home







Some students prefer to navigate the Playlist in school



Station Rotation: one of the NxGBL modalities employed in this study

SALVADOR JOHN M. MAGALONG

August 29, 1985
V-Luna Medical Hospital, Quezon City
Blk 30 Lot 19 Area S Queen's Row, Molino, Bacoor, Cavite, Philippines
E-MAIL : sj_john09@yahoo.com; john.magalong@dlszobel.edu.ph

EDUCATION

November 2010 – 2017 Philippine Normal University Manila
M.A. Science Education Major in Physics

June 2002-March 2006 Philippine Normal University Manila
Bachelor of Science in Physics for Teachers

- **Cum Laude** – rank 26

June 1998- March 2002 St. Francis Learning & Business High School Cavite

- **Salutatorian**

June 1992- March 1998 Queen's Row Elementary School Cavite

AWARDS RECEIVED

Scholarship Grantee from 2002-2006

- Recipient of DOST-SEI RA 7687 Science and Technology Scholarship (Program A)
- Consistent Dean's Lister

WORK EXPERIENCE

June 2013 – Present De La Salle Santiago Zobel School Muntinlupa City

- Physics Teacher / Microsoft Innovative Educator Expert 2016 / Grade 10 - Team Leader

June 2012 – June 2013 PAREF Southridge School for Boys Muntinlupa City

- General Science Teacher

May 2010 – February 2011 San Beda College Alabang Muntinlupa City

- High School Physics and General Science Teacher

June 2007-March 2010 University of Perpetual Help DALTA Molino, Cavite

- High School Physics Teacher
- JR Supreme Student Council Moderator

- Ranked 2nd – Faculty Year End Evaluation (School Year 2008 -2009, 2009-2010)
- Ranked 5th – Faculty Year End Evaluation, Punctuality and Perfect Attendance Awardee (School Year 2007 -2008)

June 2006-March 2007 STI Academy Las Pińas City

- High School Teacher

GOVERNMENT EXAMINATION PASSED

Licensure Examination for Teachers (October 2006)
General Rating : **84.20**

RECENT SEMINARS/ WORKSHOPS ATTENDED

- Samahang Pisika ng Visayas at Mindanao, Silliman University, Dumaguete City
  Speakers: Various / Presenter
  Presented a Paper entitled: "Classroom-Based Research: Correlation of Students' Views in Physics to their Term Academic Grades"
  October 20-22, 2016

- Senior High School for Science, DLSU, Taft Avenue, Manila
  Speakers: Various
  Participant in the Seminar-Workshop for Senior High School in Physics
  April 25 - May 6, 2016

- Apple Summit 2016: Teacher Sharing and Student Showcase, EDSA Shangrila Hotel
  Speakers: Various/ Speaker
  Teacher Sharer on Using Physics Apps
  April 27 - 29, 2016

- Samahang Pisika ng Visayas at Mindanao, Cavite State University, Indang, Cavite
  Speakers: Various / Presenter
  Presented a Paper entitled: "Mindscaping: Its Influence on the Academic Performance of De La Salle Santiago Zobel School Junior Students in Heat and Temperature Concepts"
  October 22-24, 2015

- Education Technology Seminar on Gooru Learning, LRC, DLSZ
  Speakers: Ms. Emmy Baylon; Mr. Kenny Benosa; Ms. Leah Castillo
  August 26, 2015

- Innovation Through Science and Technology Education, DLSU, Taft Ave., Manila
  Sponsor: Philippine Association of Physics Instructors (PAPI)
  Speaker: Melecio C. Deauna, Ph. D
  August 15, 2015

- International Conference in Teaching, Education and Learning, Dynasty Hotel, Kuala Lumpur, Malaysia
  Speakers: Various / Presenter
  Presented a Paper entitled: “Mobile Learning Device Application “String” as a Tool in Improving Performance of Students in Wave Concepts”
  July 18-21, 2015

- CINCH Learning, DLSZ, Physical Science Laboratory
  Speaker: Representative from CINCH Learning McGraw Hill
  June 4, 2015

- NxGBL Blended Learning (Next Generation Blended Learning, DLSZ, CLF
  Speaker: Dr. Mike Rapatan
  June 3, 2015

- 3rd DLSZ Research Colloquium
  Served as one of the presenters in the session. Presented a paper entitled: “Mobile Learning Device Application “String” as a Tool in Improving Performance of Students in Wave Concepts”
  May 29, 2015

- 7 Habits of Highly Effective People, DLSZ
  Speaker: Miss Meg Belen
  May 26-28, 2015

- Planning a Clean and Green Township City Beautiful Manila, Singapore
  Speaker: Various / Activistar Advocacy Representatives
  April 7-12, 2015

- 16th SPVM National Physics Conference, Xavier's University, Cagayan De Oro City
  Speakers: Foreign and Local Academic Researchers
  Served as one of the presenters in parallel sessions. Presented a paper entitled: “The Relative Effectiveness on the Use of Mobile Learning Device in the Academic Performance of the Junior Students of De La Salle Santiago Zobel School”
  October 23-25, 2015

- National Instrument Days 2014, Crimson Hotel, Alabang
  Speakers: Various
  October 20, 2104

- Google Docs Skills Training, DLSZ St. La Salle. Building 6A
  Speaker: Mr. Cesar de Guzman
  October 15, 2015

- 36th Annual Physics Seminar Convention, Dumaguete City
  Speaker: Speakers invited by the Philippine Physics Society
  April 2-6, 2014