Teachers' time allocation and students' achievement in statistics and probability

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Abstract

This study investigated teachers' instructional time allocation for the different classroom activities with focus on preliminary activities, warm-up review, establishing pre-requisites, motivation, lesson proper, evaluation, assignment, describing students' achievement level in statistics and probability. It also identified the relationship between the level of student achievement in statistics and probability and teachers' instructional time allocation, uncovered issues and challenges encountered by teachers in the instructional allocation of time and problems encountered by the students in learning statistics and probability. The study utilized descriptive and correlational research design. It was carried out to twelve senior high teacher-respondents handling statistics and to 410 Humanities and Social Sciences Grade 11 student-respondents in Area 1 of the Leyte Division, Department of Education. Data were gathered using an Instructional Time Allocation Questionnaire, Achievement Test in statistics and a qualitative questionnaire. Quantitative data were analyzed using both descriptive and inferential statistical techniques while qualitative were analyzed using thematic analysis. Findings revealed that there was a significant weak positive relationship between the achievement level in statistics and probability of grade 11 students and the instructional time allotted to preliminary activities, warm-up, motivation, lesson proper and evaluation. However, the instructional time allotted in the assignment portion of the instruction has no significant relationship to students' achievement level in statistics. Teachers' challenges in instructional time allocation encompassed challenges related to students, curriculum, and teacher-related challenges while students encountered problems of self-related, teacher-related, and materials-related problems in learning statistics and probability.

Keywords: Instructional time allocation, statistics achievement level, explanatory sequential

1. Introduction

The value of Mathematics in everyday life can never be taken for granted. Some of the life's most important qualities are being nurtured by this subject which includes critical thinking, problem solving, reasoning power, spatial thinking or abstract, creativity, and even potent communication

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skills (Haigh, 2015). Accordingly, a necessity to teach and learn the subject and eventually become a numerate that could contribute to the nations' development (Abocejo, 2014).

The Department of Education (DepEd) of the Philippines has always recognized the need to develop and produce graduates who are numerates. In fact, mathematics is introduced as early as five years old wherein a child is eligible to enter Kindergarten – the first step of the K to 12 Program as stated in Republic Act 10157 or the "Kindergarten Education Act". The inclusion of mathematics in the DepEd curriculum is sustained from the elementary level to junior high school level and senior high school level. Moreover, the mathematics in the basic education level is aimed at developing its twin goals – critical thinking and problem solving skills, in response and in support of the tenets of basic education sustainability with quality (Abocejo and Padua, 2010).

The DepEd argues that to achieve these twin goals, there is a need for an established curriculum content, a package of quality skills and processes, positive attitudes and values, and suitable materials, considering the varied contexts of Filipino students. Hand in hand with these twin goals are the development of processes and skills such as to understand, to know how to compute, to estimate and to solve, to visualize and to model; to represent and to communicate; to reason, to prove and to execute decision-making; to apply and to connect. Most importantly, mathematics in the fundamental education are also aimed at honing values and attitudes that includes accurate, creative, objective, perseverance, and productive citizens. The DepEd has acknowledged the utilization of suitable materials in teaching and learning the subject such as manipulating objects, measuring devices, computers and calculators, tablets PCs and smart phones, and the Internet.

Statistics and probability, as one of the subjects of the K to 12 mathematics curriculum, centers on honing skills in collection and organization of data with the use of tables, graphs and charts; understanding, analyses and interpretation of data; treatment with doubts; and anticipating predictions about results. Together with other strands of the K to 12 math curriculum and as a part only of the math curriculum, statistics and probability is offered as early as kindergarten and continues to elementary and junior high school except in the Grade 9. However, in the senior high school level, this subject is offered as a core and separate subject that is good for one whole semester.

Meanwhile, it is noted that mathematics education, where statistics and probability in its current setting is a part of, seems not to achieve the standards set both internationally and locally. Adler and Davies (2010) showed the outcome of assessment in the world that the knowledge of students have not attained even at least levels of competencies set by different competencies in Mathematics. Moreover, the deficiency of students' mathematics achievement is evidenced by the 2003 "Trends in International Math and Science Study" (TIMSS) results for 8th Graders was reflected in the international scene. Lower than 30 percent of the learners who were tested have attained the international standard but only lower than 10 percent have attained the first international standard out of 46 participating countries. The international benchmark confers to the students' ability to apply knowledge and understanding to a spacious kinds of situation while the advanced international standard centers to the students' capacity to establish data and information, create some generalizations, solve unusual problems, and sketch and explained conclusions from the body data.

A veritable poor achievement in the national and local settings was observed. The TIMSS result in 2003 revealed Filipino fourth grade pupils and second year high school students attained ratings of 358 and 378 in Mathematics, respectively. This boiler suite performance rating falls under the standard of 400. In the elementary mathematics, Filipino grade four pupils exhibited low

ranking of 23rd from 25 participating countries, whereas second year high school learners placed 41st out of 45 participating countries. Widespread poverty, lack of classrooms and basic facilities particularly in the rural areas of the Philippines, are among the crucial factors hindering better performance of basic education learners (Fernandez and Abocejo, 2014)

Education experts agreed that the extent of quality instructional and supervisory time are the most important variables in achieving student learning, how instructional time is utilized and allocated (Larson, 2017). In the United States, Grouws et al. (2010) revealed that one-third of available time is either spent on previously learned content or squandered altogether.

The result from the Third International Mathematics and Science Study TIMSS), Australian junior secondary school population revealed that there was 80 percent of schools educated their learners for between 186 and 205 days every year. An examination of time in instruction, on a weekly basis, revealed that about 30 percent of schools spent 221 – 240 minutes every week to Mathematics, and a slightly lesser percentage of 181 – 200 minutes every week. Of the remaining schools, about 14 percent spent less than 180 minutes every week and about 16 percent greater than 260 minutes every week (Ingvarson et al., 2004).

Meanwhile, learners of the member countries of "Organization for Economic Co-operation and Development (OECD)" such as Canada, Austria and Belgium posted a mean of 7475 hours of mandatory tenet during their fundamental and lower secondary education (OECD, 2014). Mathematics jointly with writing, and reading, and literature and the arts certifies for 45 percent of mandatory tenets of time for students in the primary school, in the midst OECD countries, and 39 percent of mandatory tenets of time for lower secondary school students with learning in first and foreign languages instead of arts. The mean of 4 percent of mandatory time of instruction for primary and lower secondary students was spent to pre-requisite subjects with independent time schedule. In the Philippines, as stated in DepEd Order No. 31, series of 2012, the time allotment for mathematics subjects for secondary is four (4) hours in a week within 200 school days.

The quantity of time employed in basic instruction or teaching is a significant number of educational pursuit. A constant result is that the loads of students' time are successfully and actively occupied important skills for academic supports predominantly towards mathematics performance (Harn, Thompson and Roberts, 2008).

Based on the first author's (of this paper) own experiences, teachers become reluctant to work on instructional and developmental activities in their respective classroom because some do not perceive to have adequate and ample available time to divide those instructional activities; however, there may be some fundamental and basic concerns of the allocation of time for teachers (Silver et. al., 2005). The manner that time is budgeted to various kinds of activities in the classroom shows what and how the students learn and develop.

Essentially, the goal of this endeavor is to examine how mathematics teachers allocate instructional time in the classroom, what their influencing factors and priorities are for budgeting their time in that manner. Focusing at these concerns of allocation of time can extend better to describe the Mathematics structure in the classroom at the present scenario and may provide inputs for some intervention scheme aimed at coming up with a better and quality education.

1.1 Study objectives and hypothesis

This study looked into the association of the teachers' instructional time allocation and the students' achievement in statistics and probability. Specifically, the study examined the teachers' instructional time allocation in preliminary activities, warm-up review/establishing prerequisites, motivation, lesson proper, evaluation and assignment. The students' achievement level in statistics

and probability were also examined, the relationship between the level of achievement in statistics and teachers' instructional time allocation. Issues and challenges encountered by teachers in the instructional allocation of time were likewise assessed and problems encountered by the students in learning statistics and probability.

The study tested the null hypothesis of no significant relationship between the level of achievement in statistics and probability among grade 11 senior high school students and teachers' instructional time allocation.

2. Literature Review

The implementation of the K to 12 Program through Republic Act 10533 also known as the "Enhanced Basic Education Act of 2013" has paved the way for the revision of the curriculum in Basic Education in the Philippines, including the Mathematics curriculum. Major changes happened in the contents of the curriculum especially that the spiral progression approach is the curriculums' major feature. More specifically, one major revision of the Mathematics curriculum of the K to 12 program is the introduction of statistics and probability from kindergarten to senior high school level.

The spiral progression approach to the curriculum is evident on how different topics in statistics and probability is being laid down in all levels of the K to 12 Program. In the kindergarten level, statistics and probability is focused at developing skills on organizing and interpreting data which includes the collection of data on one variable through assessment and inquiry, creating and discussing simple pictographs, and telling possible outcomes of familiar events (Competencies and Standards of Five-Year-Old Filipino Children, 2016).

Learning the different concepts in statistics and probability is equally important as learning any strand in mathematics. The subject is not only about calculation of numbers or conducting statistical tests but most importantly, it is a spacious array of knowledge and logical steps that permit a learner to assess claims based on quantitative evidence (Frost, 2018). With statistics, a person's skill to differentiate between rightful and questionable conclusions is developed.

Teaching mathematics should focus on developing an enquiry skill in mathematics and approaches with intuition, confidence, courage and curiosity (Boaler, 2018). With the introduction of statistics and probability in the K to 12 Math mathematics, one of the major concerns of those who teach the subject, is how to ensure that the students learn statistical ideas and principles and are able to put and practice the learnings in the real-world circumstances (Garfield, 1995). Even though teachers express disappointment about difficulties of students in applying and learning the course materials. Many mentors do not notice the growing body of research related to teaching and learning statistics. Jordan and Haines (2006) stressed that statistical training should promote the transmission and requisition of concepts across contexts, including real-world contexts in which many solutions to problems predominate by highlighting on imaginary mastery and skill improvement. Alwan, Wardhani and Mitakda (2013) emphasized that for a nation to develop economically, there is a need for children to be literate in statistics.

Indeed, mathematics education contributes to a major extent in the nations' development, prompting the leader of the nations to emphasize in the nations' agenda (Patena and Dinglasan, 2013). However, an observation that is very alarming to students in the Philippines shows that they top in the acquisition of knowledge but fairly low in lessons availing higher order thinking skills (Jolejole-Caube, Dumlao and Abocejo, 2019). In fact, the data of worldwide evaluation projected

that the knowledge of the students have attained only a minimum competency level assessed from the various mathematics curricula (Adler and Davis, 2010).

Statistics and probability has been classified as part of the mathematics curriculum. However, students in the international scene have shown low mathematics performance as evidenced by the outcome of the TIMSS. In 2003, TIMSS was administered to the grade 8 level and results were reported that 30 percent of the students who underwent test have attained the international standard but 10 percent lesser have succeeded the advanced international standard out of the 46 participating countries. This international standard refers to the proficiency of the learners to the application of knowledge and understanding to different scenarios while the ameliorated international standard center on the skill of the learners to establish data, create conclusions, answer problems which are not common, and justifying and drawing conclusions from data.

In a similar scenario, Filipino students exhibited a very weak performance in mathematics as shown in the 2003 TIMSS data where fourth graders and second year high school students performance ratings fall under the standard of 400 set by the TIMSS. Surprisingly, Filipino grade four pupils settled in the bottom 23rd of 25 countries while second year high school students ranked 41st among 45 countries.

Data of the Philippines' National Statistical Coordination Board (2007) showed that students' performance reflect a decreasing trend as evident in the National Achievement Test (NAT) results for school year 2005–2006 where overall achievement rate of grade 6 pupils was only 54.5 percent while only 44.3 percent for Fourth Year high school students, a good result and both have lowered by four and two percent points, respectively, from the previous year. Moreover, both elementary and secondary levels have decreased in all other subjects by about one to six percent of points. It is a disturbing result that must properly be resolved by the teachers of the country through the National Education Testing and Research Center (NETRC) and the Department of Education. Meanwhile, NAT results from school year 2013-2014 to school year 2014-2015 has minutely increased just about 0.11 percent. The fact is, students' performance in Mathematics for these school years decreased by 2.58 percent, the second biggest decline of Filipino learners (Coloma, 2017).

Students' poor academic achievement in mathematics including statistics and probability is affected by a lot of internal and external factors. Cherney and Cooney (2005) argued that having an anxiety on the subject gives a disadvantage. Anxiety occurs as a results of exposure to the subject and that lack of self-efficacy and higher anxiety may tend students to fear the subject, results to a poor performance (Jolejole-Caube, Dumlao and Abocejo, 2019). On the other hand, study habits and techniques of students are other common factors which affect performance in mathematics (Patena, Luz, and Dinglasan, 2013). Especially nowadays, the generation of students have showed a tremendously different study habits. This is downplayed since mathematics is taught in English language where many of the basic education students posses low reading comprehensive skills and competencies (Rodriquez and Abocejo, 2018; Cuñado and Abocejo, 2018).

Meanwhile, Kiwanuka et al. (2015) revealed that the family socio-economic status, genders, previous mathematics achievement, family support, peer pressure, class average of previous mathematics achievement, students' perception of good classroom evaluation, school average of class climate (attitude toward mathematics) and of family support were significant predictors of students' performance in mathematics. The National Council of Teachers of Mathematics (2007) noted that learners who struggle in mathematics demonstrate less review of

facts in arithmetic, solve problems imprudent without restraints, having an adversity in the representation mathematical ideas mentally, have entrapped a poor sense of number, and have misery preserving information in their memories.

With the challenges encountered in mathematics including in statistics and probability, education experts are looking for ways on how to alleviate such problems. One of these interventions was to focus on how instructional time allocation of the subject affects students' achievement. Cattaneo, Oggenfuss and Wolter (2016) concluded that instructional time impacts students test score in the subject and that increasing the instructional time contributes a 30 percent to 40 percent increase in students' performance. Meanwhile, Ayodele (2014) argued that it is not the duration of instructional time that affects the learning, but rather, the time the students themselves are appealed in scholarly activities. Essentially, the activities would elevate student engagement of time on language (Trazo and Abocejo, 2019) and numerical skills (Jolejole-Caube, Dumlao and Abocejo, 2019).

Indeed, the student achievement and on–task learning time are found to be strongly associated (Adams and Blair, 2019). The fundamental elements of this learning time covers the time engaged in the learning process and the time allocated to instruction, and academic productivity. But still a common scenario is that lost time occurs even though education experts are conscious of the association that remains between learning the time on task and academic progress (Codding and Smyth, 2008).

The DepEd Order No. 9, series 2005 was created directing schools to increase time-on-task for the main purpose of meeting the school days required in per school year in terms of number. This Order emphasizes that the time allotment for each subject area must be maximized and that activities that will hinder the teaching-learning time must be lessened including the extra-curricular duties of the teachers. It clearly states that school days should be devoted to instruction and that instructional time must be efficiently and effectively used. As mentioned in the 2013 K to 12 curriculum guide, mathematics subject where statistics and probability is a strand, is allotted at a maximum 50 minutes per day in the elementary level and 4 hours in a week for the secondary junior high school level. Meanwhile, statistics and probability in the senior high school level is a separate core subject in the Grade 11 and is offered during second semester of every school year.

Though research has shown that teachers differ in the classroom time allocation (Jones, 2012), there is a dearth of literature that could show teachers have their own ways of allocating or budgeting their time in instruction or in the classroom and the reasons for such time allotment. Conducting research on the priority activities of the teachers inside their classroom could give insights as to why such certain activities have been utilized to deliver the competencies rather than unrelated activities. These classroom activities given by the teachers to their students have great influence on their learning and performance (Foss, 2010).

There are lots of activities that a teacher must do inside his or her classroom and this includes recalling previous material or competency, discussing and explaining previously assigned assignment or performance task, theory of development (considering teacher doing examples, teacher discussing concepts that are new with logical views other than examples that are not related, exploratory activity, reporting in the class driven by learners explaining and interpreting resolution or ideas), and students making assignment or exercising problems for enhancement. Other teachers have signified that it can complicate to make some works (particularly exploratory, explanatory, and other activities that are student-centered) because there is no ample instructional time available.

Jones (2012) noted that most of the classroom time of a teacher is allocated to seatwork for students and instruction in the class which involve lecture, explanation, or review of previous lessons. Meanwhile, Stigler, Gallimore and Hierbert (2000) revealed that on the average, teachers allocate 11 minutes for showing examples and/or exhibit procedures, and practicing the skills of the students. Also, it takes 6 minutes to check students' homework and 5 minutes on warm-up review activity on procedures and interpretations and on completing the rest of the worksheets.

Teaching in an ordinary classroom setting involves making activities that entail a important amount of quality time. Silver et al. (2005) found out that students in the classroom were encouraged by their teachers to consider multiple solutions to a mathematics problem. However, most of the teachers said that they had difficulty in doing such activity due to time constraints while some teachers were also doubtful whether they could successfully implement such idea considering the fact that they have to cover a specific content in the prescribed time. Mathematics teachers are confronted with lots of problems particular to teaching the subject. Mazana, Suero-Montero and Olifage, 2019) revealed that teachers conveyed problems in teaching the math due to lack of tools in making the teaching of the subject more interesting, insufficient instructional time, memorizing mathematical problems without understanding, and a feeling that students have negative attitude towards the subject.

Another issue that teachers face related to teaching Mathematics in general is their content knowledge itself. In a study presented internationally which, figured out that bases for mathematical knowledge gained by elementary and secondary pre–service mathematics educators from 17 nations at the end of their practice workshop, revealed that the Philippines reported similar data to that of TIMSS study. The endeavor showed that the performance of the Philippines was way below Taiwan and Singapore, the highest scoring countries. In fact, the performance of the Philippines' was below the mean of 500 in the international setting.

2.1 Theoretical background

This study anchored its framework on the Theory of Cognitive Development conceptualized Piaget (as cited in Mcleod, 2018). This theory discusses how is a mental model of the world is being drawn by a child. Moreover, Piagets' theory posited that cognitive development is a logical step that happens because of biological maturation and interaction with the ecology. In this theory, three basic components were established by Piaget namely schemas, adaptation processes and stages of development. To Piaget, schema is the primary building block of intelligent behavior. These schemas are "units of knowledge, and each relates to one aspect of the world, including things, scenario, and abstracts".

According to Wadsworth (2004), schemas could be viewed as "index cards" filed in the mind or brain, each one tells an individual how to retaliate to a particular stimulus. When talking of the development of the psychological processes, Piaget was pointing to an increased in the number and disturbance of the schemata of a human person. Hence, when students can answer the different activities given by the teacher in any part of the lesson, it could be attributed to the schema that a students was able to form in his brain. On the other hand, when students failed to answer a question, it is said that he has not developed fully schemas in his or her brain.

Meanwhile, Piaget (as cited in Mcleod, 2018) see intellectual and behavioral growth as a process of adaptation and condensation to the world which happens through assimilation, accommodation and equilibrium. Every time a student is confronted with a new situation, he or she uses his existing schema, this is assimilation. However, there are instances where these existing schema does not work, thus a student must be able to change his schema to go against with the

new instance or scenario by means of accommodation. When things smoothly happen, equilibrium is being achieved by the student, which act as the driving force for learning.

Piaget (as cited in Mcleod, 2018) suggested four stages of cognitive development which involves "formal operational stage, pre-operational stage, concrete operational stage and sensorimotor stage". These stages reflect the increasing sophistication of the child's thought. With this Piaget's theory, it is encouraged that classroom learning must be student-centered and the teachers' approach must be through active discovery learning. In other words, the teacher must only act as a facilitator.

In essence, teachers are encouraged to give highlight on the process and delivery of learning rather than the output or product, utilize discovery method in teaching and incorporate conspiracy as well as individual engagement or activities, create situations that present solutions to problems and create dissemblance, and lastly, evaluate the level of the development of the child in order to give appropriate and suitable task to the student. Therefore, looking at the activities that a classroom teacher prioritizes and that is through his or her instructional time allotment to the different activities in the class would be very important as it may impact student learning.

2.2 Conceptual Framework

The variables considered in this investigation are the teachers' instructional time allocation for the different classroom activities such as preliminary activities, warm-up review/establishing pre-requisites, motivation, lesson proper, evaluation, assignment. Also, this research aims to describe students' level of achievement in statistics and probability.

Furthermore, the researcher also targets to identify relationship between the achievement level of the grade 11 students in statistics and probability and teachers' instructional time allocation. Investigating these variables will provide inputs on the possible intervention scheme that may be proposed to address issues and concerns in the subject statistics and probability in the hope of providing a more quality education to the students. Figure 1 outlines the conceptual framework of this study.

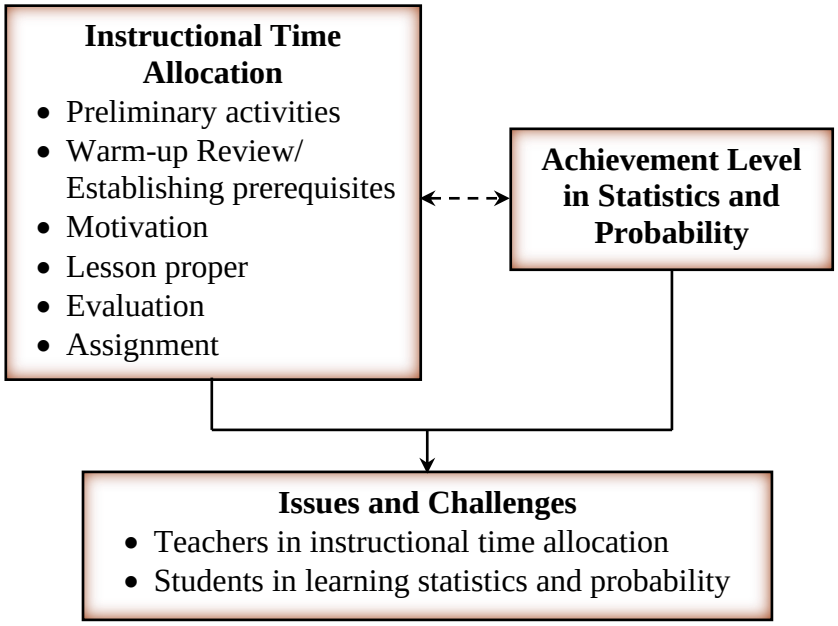

Figure 1. Conceptual Framework of the Study

3. Research Methodology

3.1 Research design

Quantitative and qualitative research approaches were employed in this study. The quantitative research approach employed a correlational and descriptive research designs. Barrot (2017) explained that a descriptive research design provides a comparatively package of landscape of what is undergoing at a given time. Moreover, descriptive research design is a procedural type which entails observation and description of the manner of the subject without modifying it in any means (Shuttleworth, 2008). Descriptive research design is appropriate in this study since the researcher also described the teachers' instructional time allocation and student's level of achievement in statistics and probability. Meanwhile, to explore on the issues and challenges encountered by students and teachers, qualitative methods was utilized.

3.2 Research locale

This study was administered in Area I of the Division of Leyte covering six (6) municipalities. Among these municipalities, only five (5) offered senior high school program in Humanities and Social Sciences. There were seven (7) senior high schools offering HUMSS in areas under study.

3.3 Study respondents

This research involved teachers and student-respondents. Particularly, a complete enumeration of senior high teachers handling statistics and probability for Humanities and Social Sciences (HUMSS) strand was carried out to a total of 12 teacher-respondents. On the other hand, the population of students considered in this study was all HUMSS Grade 11 students in Area 1 DepEd Leyte Division in Leyte, Philippines. A total of 410 student-respondents were randomly chosen for this study. To determine the student-respondents, the study utilized a stratified random sampling technique with proportional allocation per school. Then, students per school were chosen using stratified, then simple random sampling.

3.4 Ethical considerations

Necessary permission letters to the Schools Division Superintendent (SDS) of Leyte Division together with the School Heads were secured prior to the conduct of the study. The student-respondents in this study were on voluntary participation and were made to sign a informed consent. Confidentiality and anonymity of the data gathered were highly observed. Respondents who accomplished questionnaires were kept in a secured area. The researcher also ensured that respondents were not harmed during and after the data collection. It was also emphasized and explained to the school heads that the results of this study would not affect the school's performance.

3.5 Research instruments

This study utilized researcher-made instruments. Two categories of instruments were used, for teachers and for students. The researcher used an Instructional Time Allocation Questionnaire and Qualitative Questionnaire to gather data from the teachers' group. Meanwhile, an Achievement Test in statistics and probability and Qualitative Questionnaire were used to collect data for the students' group. The instruments were described as follows.

A researcher-made Instructional Time Allocation Questionnaire was used to gather the time allotted by the teacher-respondents for the different activities in a math classroom. This

instrument aimed to find out the time (in minutes) allocated to each part of the lesson plan as educators conduct the activities in class which include preliminary activity, warm-up review or establishing prerequisites, motivation, lesson proper and evaluation. A qualitative questionnaire for teachers was used to collect data on teacher's issues related to instructional time allocation.

After construction of the sample questions, experts in languages and mathematics were invited to check it in order to establish the trustworthiness of the instrument.

To gather data on students' achievement level in statistics and probability, a researcher-made Achievement Test in statistics and probability was used. This is a multiple choice type of test composed of 40 items covering basic concepts on random variables, probability distributions including on finding its mean and variance, normal distribution and its applications, z-scores, regions under the normal curve, locating percentiles under the normal curve and sampling distribution of sample means. The construction of the test started with the construction of the table of specifications to identify the coverage of the test. Then, the construction of items followed. Afterwards, three mathematics master teachers were invited to ensure the validity of the test in terms of its content.

Then, the instrument was administered for pilot examination. Data of the pilot test was used to conduct the item analysis of the test and were subjected to Cronbach's alpha reliability test. Overall, the test has a 0.81 Cronbach alpha reliability coefficient. Meanwhile, results of the item analysis revealed that there were three items that needs to be revised. After revising the three items, it was submitted back to the three mathematics master teachers wherein they approved the revision made by the researcher.

A qualitative questionnaire was utilized to gather data on students' challenges related to learning in statistics and probability. After construction of the sample questions, experts in languages and mathematics were invited to check it in order to establish the trustworthiness of the instrument.

3.6 Validation of instruments

The researcher-made instruments underwent a validation process. After questionnaire construction, three Master Teachers in mathematics and languages were requested to provide content validity. Suggestions for improvement were considered as basis for the revision of the instruments. The improved and revised instrument were submitted again to the math and language teacher experts for approval.

A pilot test was conducted in a school outside the study area. Necessary adjustments on the instruments were made based on the results of the pilot test. For the achievement test in statistics and probability, data of the pilot test were used to conduct the item analysis of the test and calculation of the Cronbach's alpha reliability coefficient wherein it got a value of 0.81. Results of the item analysis revealed that there were three items that needed to be revised. After revising all the instruments, it was submitted back to the three mathematics and language master teachers for final review and assessment.

3.7 Data gathering procedure

Questionnaires and observations were utilized to collect information or data for this study. The researcher assured a permission to conduct the study from the Schools Division Superintendent (SDS) of DepEd Leyte and the School Heads of the secondary schools of the teacher-respondents. Upon approval of the permission letters, the researcher started collecting the data following four phases.

In Phase 1, teacher-respondents have undergone an observation on their actual instructional time allocation for their statistics subject. The researcher together with other teachers on the different classroom activities.

For Phase 2, these teacher-respondents were asked to accomplish a questionnaire focusing on the different issues and challenges that they encounter in teaching the subject in relation to instructional time allotment. Phase 3 of the data collection involved the student-respondents answering the achievement test. The researcher was the one who administered the test and it was emphasized that the test is good for an hour only. Lastly, in Phase 4, student-respondents were asked to accomplish a questionnaire regarding the issues and challenges that they encounter in learning the subject. After acquiring the data, the responses were tallied, tabulated, transcribed and treated with quantitative and qualitative data analysis tools and were analyzed and interpreted.

3.8 Treatment of data

In the processing of data, the following statistical techniques were employed; mean, standard deviation, frequency and percentages describe the students in relation to their achievement in statistics and probability. The Pearson product moment correlation was used to find out the degree of relationship between the instructional time allocation (preliminary activities, warm-up review/prerequisites, motivation, lesson proper, and evaluation) and achievement level in statistics and probability at a 0.05 level of significance.

Meanwhile, the data gathered from qualitative questionnaires both from teachers and students were analyzed using thematic analysis. This type of data analysis technique is known for its flexibility in generating themes from data in the sense that there is no specific research design associated with it. Finally, thematic analysis follows six phases which includes naming, defining, familiarizing, creating initial themes, reviewing initial codes and generating the initial codes (Braun and Clarke, 2013).

4. Results and Discussion

4.1 Teachers' instructional time allocation

Working as a teacher requires excellent time management skills especially in classroom instructions. With the limited time allotted to teach a particular subject area like in statistics, there is a need for teachers to effectively allocate such time in order to accommodate concept learning, practice exercises for mastery and assessment among students. Through this, teachers are able to increase their productivity and provide a better education for their students. In this research, teachers' instructional time allocation was investigated through classroom observations and results are presented in the table that follows.

Table 1. Observation results on teachers' instructional time allocation (in minutes)

Components of classroom instruction	Mean ($\bar{x}$)	Percent (%)	Standard Deviation (SD)
Preliminary activities	3.55	6.00	1.92
Warmup	4.93	8.00	2.32
Motivation	4.14	7.00	1.27
Lesson proper	33.19	55.00	9.74
Evaluation	11.60	19.00	3.43
Assignment	2.59	4.00	1.91

Data from the table above shows that on the average, the teacher-respondents allocate most of the instructional time in statistics to lesson proper part which accounts for 55 percent of the whole period. In the lesson proper portion of the lesson plan, the teacher introduces the topic and have an active discussion of the concept with the students. According to Witherspoon, Sykes and Bell (2016), among instructional practices that teachers employ to promote learning that include lectures, recitation, work on projects, and others, discussion is an important, even critical, method. Also in this part, the teacher demonstrate examples and non-examples related to the focused topic, allows the learners to practice the newly presented topic, monitors and give immediate feedback to learners regarding their performance on the topic. The lesson proper of a teacher ends with a generalization of the learned topic. With these different activities under lesson proper and considering its importance in the concept learning of the students, it is not surprising that teachers have allotted much of the time in it.

Next to lesson proper, teacher-respondents had allotted more time to the evaluation part of their instruction or that is about 19 percent of the whole class period. During the evaluation part of the instruction, the teacher assesses the students' learning on the topic presented by giving a set of problems in a form of a quiz. The main purpose of this part is to check whether the students have attained the objective set at the start of the class. Tests are very important for it helps chart the progress of every student, setting goals for learning and understanding what they're learning (Gewertz, 2014). Definitely, teachers must give enough time for students when answering tests especially if the main aim of the test is to reveal their extent of learning on a specific topic.

Meanwhile, doing warmup activities, preliminary activities and motivation were given by the teacher-respondents an allotted time that is about 6 percent to 8 percent of the whole class period. These results may be attributed to the fact that the main purpose of these activities is only to prepare the students for the lesson proper, hence only a small amount of time were allotted to these parts. Lastly, giving of assignments on the average, costs about 4 percent of the whole class period and this may include giving of instructions to students about what to do in their homework.

4.2 Students' achievement level in statistics and probability

It is shown in Table 2 that the respondents have attained an Average achievement level in statistics. However, this mean score was only about 50 percent of the total number of items and student-respondents has not attained the 75 percent cut-off passing score. Looking at a closer look, it is reflected from Table 3 that only about 12 percent of the student-respondents were at least in the Moving Towards Mastery Level while majority of the students or 88.3 percent have a score ranging from average to very low level.

Table 2. Achievement test result in statistics and probability

Score Range	Frequency	Percentage	Description
02.50 – 07.49	5	1.23	Very low Mastery
07.50 – 17.49	144	35.12	Low Mastery
17.50 – 32.99	213	51.95	Average Mastery
33.00 – 42.99	46	11.22	Moving Towards Mastery
43.00 – 47.99	2	0.48	Closely Approximating Mastery

Students perceived strictness while teaching mathematics is a foremost reason of low achievement in mathematics while teachers see the lack of exercise as a major cause (Jameel and

Ali, 2016). Also, parents revealed that the lack of attention is a major cause of students' low mathematics performance. The achievement test that was given to the students cover basic concepts on random variables, probability distributions including on finding its mean and variance, normal distribution and its applications, z-scores, regions under the normal curve, locating percentiles under the normal curve and sampling distribution of sample means.

The results of this study on the achievement level of the respondents, reflects the negligence of the students' performance in mathematics in the international level as assessed from TIMMS 2013 results. Of the 46 countries that participated, less than 30 percent of the students who were examined have achieved the benchmark internationally however less than 10 percent of them have attained the advanced international benchmark. Similarly, these results are in line with the poor performance that is reported in the local and national settings. The results of the 2003 Philippine TIMSS were analyzed and showed that fourth grader pupils and second year high school students have attained an overall performance ratings of 358 and 378 in Mathematics, respectively. These ratings fall under the standard of 400 known by the TIMSS. Filipino fourth graders ranked 23rd from the 25 participating nations in the elementary mathematics, while the second year high school students ranked 41st among 45 countries.

4.3 Correlation between achievement level in statistics and probability and instructional time allocation

As can be gleaned from Table 3, the achievement level in statistics has a slight positive relationship to the instructional time allotted to preliminary activities, warmup, motivation, lesson proper, evaluation and assignment. The Pearson's r correlation coefficients revealed a significant relationship between achievement level in statistics and the instructional time allotted to preliminary activities, warmup, motivation, lesson proper and evaluation.

Table 3. Correlation between achievement level in statistics and instructional time allocation

	r-value	p-value	Interpretation
Preliminary Activities	0.108^{ns}	0.092	Not Significant
Warmup	0.172**	0.000	Highly significant
Motivation	0.199**	0.000	Highly significant
Lesson Proper	0.161**	0.001	Highly significant
Evaluation	0.158**	0.001	Highly Significant
Assignment	0.083^{ns}	0.094	Not significant

ns – not significant ***-highly significant at α<0.01*

This means that higher achievement level in statistics is slightly associated to higher instructional time allotted to preliminary activities, warmup, motivation, lesson proper and evaluation. On the other hand, lower achievement level in statistics is slightly associated to lower instructional time allotted to preliminary activities, warmup, motivation, lesson proper and evaluation. However, the instructional time allotted in the assignment portion of the instruction has no significant relationship to students' achievement level in statistics.

4.4 Preliminary activities and students' achievement

There is no significant relationship between the time allotted to preliminary activities and students' achievement in statistics and probability. This results reflect the fact that preliminary activities inside the classroom only involves greeting students upon entering the classroom, facilitating

students to clean and arrange students' seat, prayer, checking of attendance, and presentation of the learning objective for the day. None of these preparatory activities mentioned directly relates to the concepts that students need to learn hence as a result, produces no significant relationship to students' subject performance.

4.5 Warm-up activity and students' achievement

Warm-up activities has been found to have a highly significant association with students' achievement in statistics and probability. During warm-up part of the lesson, the teacher recapitulates the previous topics tackled in class that are necessary in learning the new and current topic. Hailikari, Katajavuori and Lindblom-Ylanne (2008) found out that previous knowledge significantly influenced student achievement. Because warm-up activities provide concepts necessary in learning the current topic, thus it contributes to students' achievement on the current topic.

4.6 Motivation and students' achievement

Motivation is also positively associated with the achievement level in statistics and instructional time allocation. This affirms the findings of Yazici and Altun (2013) when they found out significant relationship between motivation and student achievement. Once these students triggered with their enthusiasm to attain something, eventually they will exert their full effort, time, and energy thus will likely to improve their school performance.

4.7 Lesson proper and students' achievement

The lesson proper which is one of the most important parts of the teaching-learning process, is indeed very significant in determining students' performance. Through this part of the lesson, students are presented with the main concept or target of the day. Characterized by having an active discussion of the concept with the students, presenting examples and non-examples, allowing students to practice the skills, giving formative feedback and ending with a generalization, there is no way that lesson proper would not be highly significantly associated with students' achievement level in the subject.

4.8 Evaluation and students' achievement

The evaluation part of the teaching and learning process involve students' answering a set of problems as a means of assessment in order to see whether the student was able to achieve the main objective of the day. In this study, the teachers' time allotment to the evaluation part of the lesson has been found to have a highly significant relationship to students' achievement level in the subject. Indeed, giving more time for students to accomplish assessment activities would give them more opportunity to practice their skill by answering the problems, hence contributing to their overall achievement on the subject.

4.9 Assignment and students' achievement

Teachers' time allotment to assignment and students' achievement in statistics and probability were found to be insignificant in this study. During this part of the class, the teacher presents an enrichment activity for students to do at home. Also, the teacher clarifies what the students are expected to do with their assignment. With this, it is definitely logical to produce no significant association between time allotment to assignment and students' achievement level in the subject.

4.10 Teachers' challenges in instructional time allocation

Managing time in classroom instructions is not an easy task considering that their lot of activities that must be accommodated which include doing preliminary activities, warmup, and motivation, lesson proper, evaluation and assignment. However, with effective time management skill of teachers, this issue could be addressed. Also, another way to address such issue is to uncover problems that teachers encounter in relation to their instructional time allocation and come up with possible solutions to these problems. Thus in this study, the challenges that teachers encountered in relation to instructional time allocation was also investigated. Data were gathered using qualitative questionnaires. Using thematic analysis, the qualitative data were analyzed and the researchers came up with the following themes on teachers' challenges in instructional time allocation which includes student-related challenges, curriculum-related challenges, and teacher-related challenges.

Student-Related Challenges (Theme 1). Teacher-respondents have indicated student-related challenges in their instructional time allotment which includes poor foundation of basic concepts. In fact, a teacher said that *"Students have low foundation in statistics during Junior High School like getting the mean and standard deviation*". Finding for the mean and standard deviation is a lesson in Grade 8 mathematics. On the other hand, teachers have also recognized that students have poor comprehension skills especially during problem solving. According to one of the teachers, "*Some students cannot comprehend the given instructions*". Another teacher said that "*Students have low level of analysis of problems*". Lastly, teachers also see that lack of interest in statistics is a challenge in their instructional time allotment. Definitely, students with low interest in the subject have the tendency to do activities set by the teacher slowly affecting the time allotment that has been set.

Curriculum-Related Challenges (Theme 2). One of the curriculum-related challenges to instructional time allotment as indicated by the teachers was the unavailability of learning materials. In fact, no learning modules or textbooks has been provided by DepEd for the statistics subject. With this, teachers find it difficult to look for activities for their lesson. On the other hand, teachers said that because of the congested learning competencies stipulated in the curriculum guide in statistics, they have difficulty in budgeting the lesson and also considering also the limited time for the subject.

Teacher-Related Challenges (Theme 3). Effective instructional time allotment also depends on the mastery of the teacher in that particular subject matter. Definitely, a teacher who has enough mastery of the subject has the higher chance to choose activities and discussions that would be enough for the specified time allotment and not sacrificing the quality. However, for this study, teachers said that poor subject matter content knowledge in statistics was a hindrance in their instructional time allocation. In fact, a teacher said that *"this subject is not my major that is why there a few of the topics is not familiar to me***".**

4.11 Students' problems encountered in learning statistics

This study has revealed that student's achievement level in statistics was in the average level. However, it was still below the 75 percent cut-off passing score. By investigating what problems do these students encounter in learning statistics, additional insights could be gained in order to fully understand the phenomenon and come with possible solutions in order to address this issue. Hence, this study have considered looking into the problems that students encounter in learning statistics. Data were gathered using qualitative questionnaires. Using thematic analysis, the qualitative data were analyzed and the researchers came with the following themes on students'

problems encountered in learning which include self-related problems, teacher-related problems and materials-related problem.

Self-Related Problems (Theme 1). Student-respondents was able to recognized problems in learning statistics that could be attributed to their self. Problems like lack of self-confidence, poor problem solving skills, negative attitude towards the subject, lack of interest, poor memorization skills and poor comprehension skills were highlighted by the students. Indeed, these problems are seen to hinder successful learning in any subject, not just in mathematics and statistics. In a similar study by Ganal and Guiab (2014), he also found out that personal problems that hinders learning mathematics include lack of interest and negative attitude towards mathematics.

Teacher-Related Problem (Theme 2). Hindrances in learning statistics includes teacher-related problems as indicated by the student-respondents. Particularly, teachers who has fast-paced discussions. In fact, one of the students said that "*It is when I can't process the equation and formula and find it very difficult when the teacher is too fast in lecturing*". Also, students have said that giving activities not yet discussed definitely hamper their learning in statistics. One of the students said that "Sometimes, the teacher does not discuss the activity she's giving".

Materials-Related Problem (Theme 3). Lack of learning materials such as calculators and learners' module were among the materials-related problems that students see as an obstacle in learning mathematics. Definitely, there are lot of computations in statistics and the use of calculators will serve as an aid. Some experts argue that students must be allowed to use calculator rather than manual computation for what matters more is conceptual knowledge as compared to procedural knowledge. Using calculators will lessen burden on computations, thus more time for learning the concept. On the other hand, the presence of learners' module in statistics is indeed still a challenge of the government as there is still no available modules to be distributed.

5. Conclusion and Recommendations

Grounded on the findings of the study, it is concluded that teachers' instructional time allotment to warm-up activities, motivation, lesson proper have bearing on students' achievement level in statistics and probability. Whereas teachers time allotment to preliminary activities and assignments have no bearing with the students' achievement in the subject. Teacher-respondents mostly allocate their instructional time to lesson proper followed by evaluation, doing warmup activities, preliminary activities, motivation and assignment. Teachers' challenges in instructional time allocation encompass challenges related to students and teachers, and challenges related to the curriculum, while students' problems encountered in learning statistics include self-related challenges, teacher-related challenges and materials-related challenges.

In the light of the findings and conclusion of the study, the authors recommend that educators should consider increasing the time allotted per session for teaching statistics for better students' achievement level in the subject. Capacitate statistics and probability teachers' content and pedagogical knowledge in teaching statistics. Educators should consider revisiting the curriculum guide in statistics to address issues on content congestion and give more emphasis on mastering the basic and foundation concepts. Schools should build linkages with other government and non-government organizations to address issues on insufficiency of learning materials. Further study focusing on the effects of instructional time allotment on achievement level in statistics should be conducted.

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