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Teachers and Students' Talk Analysis and Mathematics Performance

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ABSTRACT. This study analyzed the teachers' and students' talk in relation to mathematics performance of students. Descriptive correlational design was used in this study. There were 455 student-respondents who came from randomly chosen 3 sections in each grade level. The teachers in the classes selected likewise participated in the study. Data were collected using Flanders Interaction Analysis Categories System (Putri, 2014). It was found that (1) Mathematics teachers' age were in the 'Middle Age' category. Most of them are females with 'moderate experienced', and have units in the Master's level. Moreover, most of them have attended division and regional level trainings and a few have received awards and recognitions at the school level; (2) teacher talk particularly direct lecture is the most dominant FIAC; (3) the highest of the Flanders Formulates Ratios in classroom interaction is the teacher talk ratio with the teacher direct ratio greater than the teacher indirect talk ratio; (4) the students' Mathematics Performance is at the 'Satisfactory' level; (5) teachers' Profile is significantly related to the Extent of Occurrence of Flanders Interaction Analysis Categories (FIAC). Specifically, teacher with higher educational attainment tend to ask students more questions and avoid criticizing or justifying authority. Moreover, students or better trained teachers tend to be more vocal in class participation; (6) the Students' Mathematics Performance is significantly related to Flanders Formulates Ratios. Students' Mathematics Performance is significant specifically, the mathematics performance of students increases with the extent of occurrence of direct talk by teachers and decreases with the occurrence of indirect teacher talk.

Key Terms: Flanders Interaction Analysis, mathematics performance, descriptive, correlational

I. INTRODUCTION

The educational system in the Philippines has been reformed. In 2011, the Department of Education administered a shift into a fresh learning scheme – the K to 12 basic education programs under Republic Act 10533 (6 years of elementary education, 4 years of junior high, and 2 years of senior high school). This new system aims to enhance learners' basic skills, produce more competent citizens, and prepare graduates for life – long learning and employment (K-12 Education System, 2013).

The implementation of K – 12 curriculum is to 'holistically develop learners with 21st century learning skills. Classroom teachers function not as lecturers but classroom facilitators and consultative rather than directive of students learning. The teacher is skilled in managing multiple learning experiences to create a positive and productive learning environment for all the students in the classroom, foster cooperative and collaborative learning among students within the classroom, use appropriate resources and opportunities to create a learning environment that allows each student to construct his/her own knowledge (DepEd Primer, 2011).

Furthermore, a 21st century learning skills is student – centered where the learners are allowed to lead learning activities. Students are required to be active and responsible participants in the multi-faceted learning processes. The students will no longer study each subject in isolation. Instead, they work on interdisciplinary projects that use information and skills from a variety of subjects and address a number of essential academic standards (Saltrick et al., 2011).

Most of the students encountered a common issue to comprehend the texts in Mathematics content. The discipline of mathematics presents many challenges to dissimilar learners. It has often been termed the ‘’Gatekeeper’’ of success or failure for high school graduation and career success. Many students fall below their expected level of performance in Mathematics. One of the quite alarming examples here is the low performance result in the National Achievement Test (NAT) of many Filipino students. This performance of the country’s public high school students in the NAT has been on the decline and are significantly lower than the scores of public elementary students. The DepEd data showed that the average NAT score of public high school students for school year 2011 to 2012 was significantly lower at 48.9% compared to the elementary students’ 66.79% (Ordinario, 2013).

Additionally, according to UNESCO (2013), the overall Filipino learners’ NAT MPS has improved over the eight – year period but has not yet reached the 75% MPS target of Philippine EFA. The secondary students had an overall MPS of 51.41% for SY 2012 – 2013 in combined subjects of English, Filipino, Science Mathematics, Social Studies and Critical Thinking. Comparing the test scores, Secondary students scored high in Social Studies and Filipino, and scored low in Critical Thinking, Science and Mathematics.

Moreover, Experts from the University of the Philippines argued that students from the Philippines performed poorly in Mathematics and Science compared to students from other nations in the world. The experts identified several problems that contributed to the poor performance including the teaching methods used by teachers and poor curriculum. The experts claimed that the curriculum used encouraged rote learning and this made it hard for students to develop skills and understand the content (Custom Writing, 2012).

In the 21st century learning skills, according to Saltrick et al. (2011), one of the most important ways to enable students to achieve mastery is to fuse the mathematical content and mathematical practices with the 21st century learning skills to make teaching and learning more engaging, more relevant and more rigorous, ensuring that a greater number of students have an advanced level of understanding and ability in Mathematics. In the learning process, the students should know how to articulate thoughts and ideas effectively using oral, written, and nonverbal communication to decipher meaning such as knowledge, values, attitudes, intentions and use communication in a classroom setting for a wide range of purposes in diverse teams and environment.

Classroom communication is a vital element in the learning process. The quality and quantity of teacher-student interaction is a critical aspect of effective classroom teaching. The term ‘interaction’ implies an action – reaction or a mutual or reciprocal influence which may be between individuals, e.g. pupil – pupil; teacher-pupil in classroom setting or between materials and individuals or groups. An interaction is usually inferred from the behavior of persons in the environment being studied. This behavior maybe verbal or non-verbal and can be classified as being predominantly cognitive, affective or controlling in nature (Pianta et al, 2002).

According to Jastraj (2013), classroom interaction helps students to be competent enough to think critically and share their views among their peers as well as to their teachers. This classroom interaction can be analyzed with the use of Flanders Interaction Analysis Categories System (FIACS) in classroom observation. These categories include verbal and nonverbal specifically, Teacher talk (Indirect Talk**:** accepts feelings, praise or encouragement, accepts or uses ideas of students, asking questions. Direct Talk**:** lecture, giving directions, criticizing and justifying authority); Student talk (student talk response and student talk initiation) and the silence or confusion. The analysis of the classroom interaction determines which kind of talk dominates the teacher-student interaction during the entire classroom discussion. It is believed that mathematics teaching is more on teacher talk, thus, it is implied that classroom interaction is not common.

Several studies had been conducted using FIAC (Ten Categories: Accept feelings, Praise or Encouragement, Accept or Uses Ideas of Students, Asking Question, Lecture, Giving Directions, Criticizing or Justifying, Student Talk Response, Student Talk Intuition and Silence) in the secondary schools specifically, in the field of physics, biology and social studies. However, no study had been conducted in the field of secondary mathematics in which this FIAC (Ten Categories) are believed to be the variables that can affects the mathematics performance (Ordinario, 2013).

Keeping in view of the above discussion, it is helpful to assess how Mathematics is taught in the school environment particularly on how teachers and students interact in Mathematics class. This study, then, is aimed to analyze the classroom

interaction in relation to students' mathematics performance.

Statement of the Problem

The researcher aimed to analyse the classroom interaction in relation to students' Mathematics performance in Leyte National High School during the school year 2015 – 2016. Specifically, this study answered the following questions:

1. What is the profile of the teachers along?
   1.1 Age
   1.2 Sex
   1.3 Educational Attainment
   1.4 Number of Years in Teaching
   1.5 Trainings
   1.6 Awards and Recognition
2. To what extent do the Flanders Interaction Analysis Categories (FIAC) occur in classroom interaction in terms of the following
   2.1 Teacher Talk
      2.1.1 Indirect Talk
         2.1.1.1 Accept Feelings
         2.1.1.2 Praise or Encouragement
         2.1.1.3 Asking questions
         2.1.1.4 Accepts or uses ideas of students
      2.1.2 Direct Talk
         2.1.2.1 Lecturing/Lecture
         2.1.2.2 Giving Directions
         2.1.2.3 Criticizing or justifying authority
   2.2 Student Talk
      2.2.1 Student talk response
      2.2.2 Student talk intuition
   2.3 Silence
      2.3.1 Silence or Pause or Confusion
3. What are Flanders Formulates Ratios in terms of the following?
   3.1 Teacher talk ratio
   3.2 Indirect talk ratio
   3.3 Direct talk ratio
   3.4 Students' talk ratio
   3.5 Silence or Confusion ratio
   3.6 Indirect and direct ratio
4. What is the students' Mathematics performance?
5. Is there a relationship between the FIAC occurrences in classroom interaction and the profile of the teachers?
6. Is there a relationship between Flanders Formulates Ratios and students' Mathematics performance?

II. FRAMEWORK OF THE STUDY

This chapter discusses the theories and principles which were applied in this study as well as the different studies which served as the basis and reference of this present study.

The development of the original system of interaction analysis was primarily the work of Ned Flanders. Indeed, the system is often referred to as the Flanders System of Interaction Analysis (FIA) – an innovation which made possible significant insights into the analysis and improvement of instruction. Flanders' interaction analysis system is an observational tool used to classify the verbal behavior of teachers and pupils as they interact in the classroom. Flanders' instrument was designed for observing only the verbal communication in the classroom and non-verbal gestures are not taken into account.

Flanders Interaction Analysis is a system of classroom interaction analysis which concerned with verbal behavior only, primarily because it is observed with higher reliability than non-verbal behavior. Moreover, it is assumed that the verbal behavior of an individual is an adequate sample of his total behavior (Jastraj, 2013).

Flanders Interaction Analysis Categories (FIAC) is a Ten Category System of communication which are said to be inclusive of all communication possibilities. There are seven categories used when the teacher is talking (Teacher talk) and two when the pupil is talking (Student talk) and the tenth category is that of silence or confusion (Jastraj, 2013). The categories for teacher talk include accepts feelings, praise or encouragement, accepts or uses ideas of students and asking questions category, lecturing/lecture, giving directions and criticizing or justifying authority.

In this system, all teachers' statements are either indirect or direct. This classification gives central attention to the amount of freedom the teacher grants to the student. In a given situation therefore, a teacher has a choice. He can be direct, that is minimizing the freedom of the student to respond. His choice, consciously or unconsciously depends upon many factors among which are his perceptions of the situations and the goals of the particular learning situation. In order to make the total behavior or total interaction in the classroom

meaningful, the Flanders system also provides for the categorizing of students talk. A third major section, that of silence or confusion is included in order to account for the time spend in behavior other than that which can be classified as neither teacher nor student talk (Jastraj, 2013).

According to Putri (2014), Flanders Interaction Analysis is an analyzing process. An observation tally sheet is used to tally each type of classroom verbal interaction. The observer follows certain rules (which can be found in the Appendix) in deciding in which category a particular interaction belongs. Tallying is done after three seconds past each classroom verbal interaction. Then, the observer determines how much the teacher or the students have talked. Recording through an audio recorder and transcribing it is also one best method for this, since the duration of the talk can be determined and the manner and characteristics of the talk can easily be described.

Advantages for using FIACS includes its objectivity in determining the type and amount of talk since it involves counting and tallying. Moreover, FIACS is beneficial since it can be used to analyze classroom behavior and provide a description for classroom behavior. As a result, teaching strategies and style can be improved or changed once the classroom interaction patterns are assessed. This implies that when the teacher knows how long they have been talking in the classroom, they will consequently know their effectivity in motivating students to get involved in the discussion. Thus, the teacher has really to create a teaching design that will promote student-centered kind of teaching-learning process. Furthermore, teachers who received feedbacks from FIACS would use more positive reinforcements to their students, use less lecture method and allow a student-initiated discussion, and would praise, accept and clarify more the ideas of the students (Putri, 2014).

Communication among teachers and students is very important because it creates interaction patterns that will keep the students motivated in learning. Classroom social environment is necessary for every student's development. It aids in the nurturing of their behavioral, social and academic skills which help them become better individuals. Their academic success can be connected to the quality of their interactions with their teachers (Pianta et al., 1995). Student academic development could be achieved through the influence of the different classroom characteristics like class composition, student and teacher characteristics, student interactions with peers and teachers, classroom values, and classroom beliefs (Pianta, et al, 2002).

Teaching methods refer to the pedagogy, classroom management and general principles used in instruction. Teaching methods may vary depending on what fits an educator and on his or her preference on the convenience of teaching. The teacher may opt to adopt his manner of teaching depending on his educational philosophy, classroom demographic, subject areas and the school mission statement (Teach.com, 2008).

The dynamics of teaching is a crucial factor on how much students learn. Although the students' performance may not be a direct consequence of the teacher's teaching styles, it still is a factor to be considered since it creates an impact on the students' way of understanding the subject matter. The instructors usually establish a certain pattern of conduct during the discussion and the students also establish certain behaviors to coincide with the pattern. In this manner, the students create different behavioral reactions to different teachers in their way of participating in the class lesson. The combination of instructional pattern and student participation may lead to a specific class environment which is characterized by unique interaction patterns. The instructional theory of 'social emotional climate' hypothesizes that the class environment has a direct effect on every student's attitude and achievement. However, in every subject matter, there is a structure to be followed depending on the tasks required. There may be a significant difference between the academic tasks that require the students to understand and reproduce information encountered during instruction and those that require them to apply the information and draw inferences. Nevertheless, the interactions created by the students and teachers are established through this task requirement (Grouws, 1981).

Everyday, teachers usually have more than a thousand of verbal exchanges with their students. However, there could be a tendency that students could be passive and dependent on the teacher due to the latter's verbal domination inside the classroom. That is the reason why the teacher's role towards teaching and interacting with the students is necessary because it shapes their experiences in school. Instructors have significant amount of time with students. They also have multiple roles such as teaching academic skills, regulating student activity level, teaching communication skills, providing opportunities for students to form peer relations, providing behavioral support and teaching coping skills (Pianta e al, 1995). With

these responsibilities and duties, teachers should have a good relationship with their students. As what Pianta's theory proposes that when teachers has a close and positive relationship with students, they are more inclined to promote educational and student success. However, when teachers have conflictual and negative relationship with their students, they tend to control the student's behavior and usually neglect the promotion of positive school aura (Pianta et al., 1995). In this manner, it is an absolute responsibility of the teacher to establish healthy learning environment in order to avoid the neglect of educational freedom and the indifference among the students' performance.

Student's academic success is greatly influenced by different factors such as studying techniques, peers and motivations. A healthy classroom environment can also be a reason for the student to perform well in school. Thus, there should also be a good exchange of communication and interaction between them and their teachers. As students usually react to their relationship with their teachers. When they perceive that they have close and positive relations with teachers, they are more motivated to succeed and to perform well with the daily tasks in school. In contrast, when students perceive that they have conflictual and negative relationships with teachers, they are not motivated to succeed and may be defiant towards the teachers (Pianta et al, 1995). Thus there is a connection with the teachers' role towards teaching and the students' behavior because both are creating certain reaction to each other that may result to a specific classroom environment. Also, these interactions are important to the knowledge of student's academic achievement.

When students feel they have a strong and positive relationships with teachers, they are more likely to believe and love the teachers and become more motivated. In contrast, when students feel that they have a conflict and a negative relationship with teachers, they do not believe in their teachers, may not be motivated to succeed and may challenge the teachers. Finally, a negative relationship with the teacher and students will lead to student dropout rates. Nugents subsequent study (2009) showed a positive correlation between teacher-student interactions with motivation. The outcome of student learning related to teacher and student behavior and patterns of interaction in the classroom and that behavior of teachers showed significantly contributing behavior and cognitive achievement of students.

Since students and their teachers spend a significant amount of time discussing and understanding different subject matters, their interaction patterns should be more understood since the quality of their relationship could be associated with the student's academic performance. However, the association between the teacher-student relations and student academic performance is complex, and may differ across students and classrooms characteristics. Thus, the present study examined the relation of student academic achievement with classroom interaction patterns, including the classroom mean closeness of teacher-student relation, teacher instructional practices, and classroom mean of academic risk.

A study was conducted to investigate the relationship between classroom behavior and academic achievement using multiple regression procedures in which the frequencies of twelve behaviors were used to predict the achievement of 90 second – graders from 5 classes in 3 public schools. They obtained multiple correlations of .63 and .51 for fall and spring data respectively. In a similar study, reports that teaching performance accounted for a third to half of the variance in pupil spring scores when their fall scores were partial led out, and about half of the variance in mean-change scores in math's but only about 10% of the variance in reading (Ilias, et al., 2012).

Another study investigated the of classroom interactions between students and students, teacher and students on the learning of English passivation. The result of this study suggested that classroom interaction and the language output may trigger learners to notice the target form and have a positive effect on improving the learning of a foreign language (Castro, et al., 2010)

A study was conducted to determine the patterns of interdependency among classroom interaction patterns, teachers and students' variables and students' learning outcomes in physics. The result indicated that the sets of independent and dependent variables are strongly related in three independent ways (Rc = .98, .93 and .92), corresponding to the three named canonical factors/variates, and about 89% of the variance of interaction pattern and teacher and student variables. The three identified factors respectively contributed 33&, 29% and 27% of the redundant or common variance of the two sets of variables (Ali, 2004).

Innamullah and colleagues (2008) studied the teacher–student verbal interaction patterns at tertiary level education in the North West Frontier Province of Pakistan using Flanders' Interaction Analysis system. The study was significant because

its findings and conclusions may stimulate teachers to improve their teaching behavior in order to maximize student learning. Twenty-five classrooms at the tertiary level were randomly selected as samples in the study. Twenty-five observations were carried out, one in each classroom, using Flanders Interaction Analysis system to secure the data. To do this, time sampling was used and each classroom was observed for 810 seconds (13.50 minutes) in a 45-minutes class. The results showed that talk method dominated in classes. More than two-thirds of the classroom talking time was devoted to teachers talking at the tertiary level with the teachers playing the dominant role. More than two-thirds of the teachers' talking time was devoted to direct talk, which showed the direct role of the teacher and indirect role of students at the tertiary level.

This study was conducted to examine the close teacher-student relations, classroom characteristics, and interaction effects on student academic grades and standardizes achievement scores. Classroom characteristics including teacher instructional practices, class mean teacher-student relationships, and a classroom index of academic risk were evaluated for their influence on student achievement. Results indicate that a close teacher-student relations and teacher self-reported use of good instructional practices predicts positive student academic achievement. Interaction results indicate that the association between close teacher-student relations and student achievement is slightly stronger in classrooms with more academic risk, according to the models examined (Vu, 2009).

Theoretical/ Conceptual Framework

According to Vygotsky (cited in B.J 1994), social interaction plays an important role in the learning process where learners construct the new language through socially mediated interaction. Vygotsky's social – development theory was adopted and made prominent in the western world which became a foundation or a model of language development in the context of adult – child interaction.

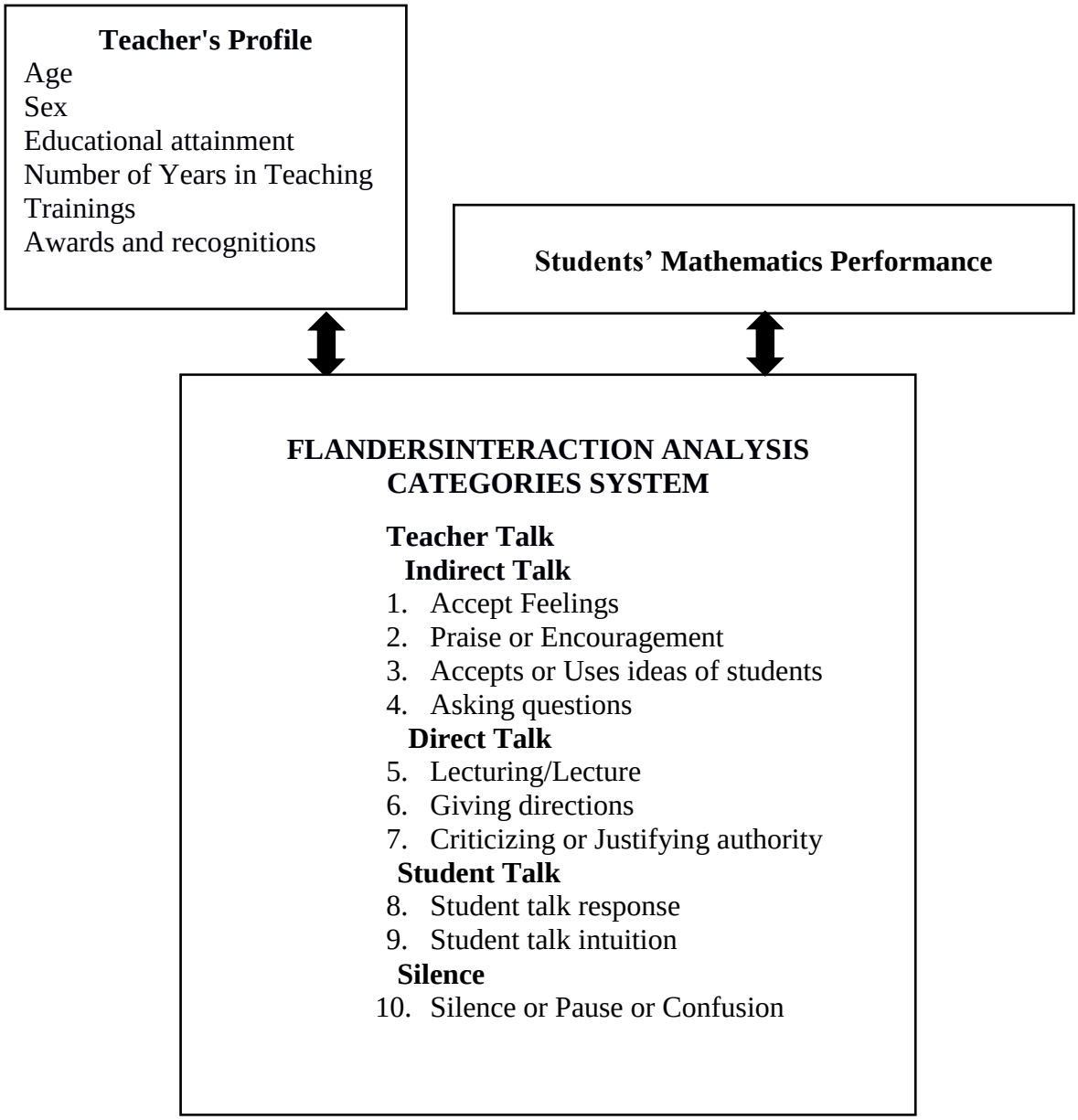
Social learning theories help us to understand how people learn in social contexts and informs us on how we, as teachers, construct active learning communities. Lev Vygotsky (1962), a Russian teacher and psychologist, first stated that we learn through our interactions and communications with others. Vygotsky (1962) examined how our social environments influence the learning process. He suggested that learning takes place through the interactions students have with their peers, teachers, and other experts.

In interaction theory, the recent surge of interactionalist approaches to social cognition can be traced back to Gallagher's proposal for a new approach to social cognition which labeled interaction theory. He argued that mainstream mindreading approaches neglect the interactive context in which social cognition is embedded, and thereby overlooked embodied and extended processes that are engaged in interaction which are important in social cognition (Micheal et al, 2013).

And the theoretical undesigning is the social interaction by Weber (in Stanger, 2004) which formed the basis of the field. Weber's definition of social interaction is still the most commonly accepted. According to him, social behavior has two components. The first is the action or the behavior itself. The second is the meaning that the actor attaches to his or her behavior. That meaning, which Weber referred to as orientation, is how a person perceives his behavior in relationship to other people. It is that knowledge of another who is affected that makes an action or interaction social.

According to Karter (Furlong et al., 1977), the theory on classroom interaction encompasses all types of interaction that goes on in a classroom. There are several different ways to categorize classroom interaction, but all of the types of interaction are important to engage learning to create well rounded young people inside and outside the classroom.

Figure 1. Conceptual Framework of the Study



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Methodology

The study made use of quantitative method. Specifically, a descriptive correlational study. Twelve sections, three (3) from each grade level (Grades 7 to 10), were randomly chosen to participate in this study. There were 455 student-respondents and 12 teacher-respondents. The data of the study were obtained using Flanders' Interaction Analysis Categories System. Flanders Interaction Analysis Categories (FIAC) is a Ten Category System of communication which are said to be inclusive of all communication possibilities. There are seven categories used when the teacher is talking (Teacher talk) and two when the pupil is talking (Student talk) and the tenth category is that of silence or confusion (Jastraj, 2013). The categories for teacher talk include accepts feelings, praise or encouragement, accepts or uses ideas of students and asking questions category, lecturing/lecture, giving directions and criticizing or justifying authority. The researcher requested permission from the principal of the participating school, the locale of the study. The data gathering procedures include the observation of the classroom, recording of the interaction, tallying of the Flanders Interaction Analysis Categories and evaluation of the interaction. The researcher used the following norms of interpretation which were adapted from DepEd (2015) to describe students' Mathematics Performance.

Ranges	Description
95 – 100%	Outstanding
85 – 94%	Very Satisfactory
80 – 84%	Satisfactory
75 – 79%	Fairly Satisfactory
Less than 75%	Did Not Meet Expectations

Research data were presented in textual and tabular forms. Percentages, Frequency distribution, and the Means were utilized in presenting, analyzing, and interpreting the research data. The Spearman Correlation was utilized to analyze data if there is a relationship between the Classroom Interaction Analysis and Students' Mathematics Performance. The correlation was tested for its statistical significance using a two-tailed test with an alpha value of 0.95 and $p < .05$ level of significance.

III. RESULTS AND DISCUSSION

This chapter discusses the analysis of the data gathered with their corresponding presentation in five parts: (1) Profile of the Mathematics Teachers, (2) Extent of Occurrence of Flanders Interaction Analysis Categories (FIAC) in classroom interaction, (3) Flanders Formulates Ratios, (4) Student's Mathematics Performance (5) Relationship between the extent of Occurrence of FIAC in classroom interaction to the profile of the teachers and (6) Relationship between Flanders Formulates Ratios and students' Mathematics performance.

Profile of the Mathematics Teachers

The demographic variables for the teacher profile include the age, sex, number of years of teaching experience, educational attainment, professional trainings, and the relevant awards of recognitions are presented on Table 1.

Age. Table 1 shows that the mean age of the mathematics teachers is 40.5 years described as 'Middle Age'. This is indicated by the highest total frequency count of 7 or 58.33% of the teachers who belong to the age range of 36 – 50 years, described as 'Middle Age' category. A total of 25% of them are 'Young', which is indicated by the frequency count of three (3) in the 21 – 35 years age category, and only 2 or 16.67% (which are the least total number) of the teachers are in the 'senior' age category. Thus, the result imply that majority of the teachers are belonged to the age category range of 36 – 50 years which is the middle age stage. According to National Union Teachers (NUT), teachers play an invaluable role and make significant contributions to the schools in which they work in the maturity stage. In addition, the quality of work of the teachers in this age category have in the Office for Standards in Education (OFSTED) significantly above the national average with 90% of lesson being satisfactory or better and majority of whom were aged between 30 and 50 (Redwood, 2008).

Sex. As shown on Table 1 most of the mathematics teachers are female. This is indicated by the total frequency count of 7 or 58.33% of teachers while the remaining are males with a total frequency count of 5 or 41.67% of teachers.

According to Nelson (2010), the Professional Regulation Commissioner Nilo L. Rosas believes ''Male teachers can be as nurturing, caring and competent as their female counterparts''. But male teachers, especially in public schools had become an ''endangered species'' said Rosas. The former president of the state – run Philippine Normal University lamented what seemed to be a perception shared by many people that teaching is a profession primarily for women. Further, the Secretary of Education Jesli A. Lapus said male teachers are a vanishing breed, accounting for only a very small portion of the entire teacher population in the country,

Philippines, at present. Since Women – powered DepEd records furnished to the Philippine Daily inquirer showed that 423, 549 or 86.3%, of 491,338 teachers in public elementary and high schools all over the country were women. Hence, the result on sex of the teachers is consistent with the above report with female's teachers outnumbering their male counterpart.

Number of Years in Teaching. Based on Table 1, shows that the mean number of Years in Teaching of the 12 Mathematics teachers is 15.08 described as 'Moderately Experienced'. This means that most of teachers have been teaching for 15 years and more. In particular, 4 or 33.33% of the teachers have 1 – 5 years of teaching which is described as ''Novice''. One (1) or 8.33% out of 12 teachers have 6 – 10 years' experience described as 'Slightly Experienced'. The remaining 5 or 41.67% teachers have 16 – 20 years of teaching experience described as 'Experienced' and there were 2 or 16.67% teachers with at least 21 years in teaching described as 'Highly Experience'.

Additionally, the above result confirms the study of Stephen Sawchuk (2015). According to him, teachers' ability to improve student achievement persisted well beyond the 3 – 5 years in teaching, while the teachers did make the most progress during their few years in the classroom, teachers improved their ability to increase student achievements between their 10– 30years in the teaching profession. Although, a previous study revealed that more than half – million students concluded that teachers experience is not significantly related to achievement in their profession. (TNTP, 2012)

Educational Attainment. Table 1 further indicates that 4 out of 12 teachers have earned Complete Academic Requirements (CAR) at the Master's Level. These CAR holders are teachers who have completed the academic prerequisites of a Master's degree but have still to finish the thesis writing required to earn MS or MA degrees. The CAR holders comprise 33.33% of the teachers while the other 8 or 66.67% of the total have earned Master's degree units.

Furthermore, this result implies that the teachers should pursue and finish their graduate studies. The educational attainment of employed teachers affect the dropout rate of the schools (Darling & Hammond, 2000). They recommend that schools should encourage hiring teachers with higher educational attainment or with post-graduate certification in order to decrease dropout rates and to encourage students to attain higher grade level.

Trainings. Table 1 shows that the number of teachers who have attended trainings in the division and regional level has a total frequency count of 5 or 41.67% and total frequency count of 7 or 58.33% respectively. In the national level 4 out of 12 or 33.33% of the teachers have attended, and in the international level only 3 or 25% of the teachers attended trainings relevant to their profession.

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Table 1. Distribution of Math Teachers According to Age, Sex, Number of years inTeaching, Educational Attainment, and Number of TrainingsAttended and the Awards and Recognition Received.
(N = 12)

Teachers Profile		
Age	**f**	**%**
51 - 65 (Senior)	2	16.67
36 - 50 (Middle Age)	7	58.33
21 - 35 (Young)	3	25.00
Total	12	100.00
Mean	40.5 (Middle Age)	
Sex	**f**	**%**
Male	5	41.67
Female	7	58.33
Total	12	100.00
Number of Years in Teaching	**f**	**%**
21 above (HE)	2	16.67
16 - 20 (E)	5	41.67
6 - 10 (SE)	1	8.33
1 - 5 (N)	4	33.33
Total	12	100.00
Mean	15.08 (Moderately Experienced)	
Educational Attainment	**f**	**%**
Units in M.A.	8	66.67
CAR in M.A.	4	33.33
Total	12	100.00
Number of Trainings Attended	**f**	**%**
School	5	41.67
Regional	7	58.33
National	4	33.33
International	3	25.00
Awards and Recognition Received	**f**	**%**
School	8	66.67

Legend:
HE – Highly Experienced
E – Experienced
ME – Moderately Experienced
SE – Slightly Experienced
N – Novice

The results reveal that teachers have attended trainings mostly at the division and regional level in the past 5 years although some have attended national and international trainings. A stand-alone workshop has less than 5% chance of actually changing teacher practice in the classroom. However, if you add on-going and embedded professional development and provide professional learning communities where teachers interact with their colleagues, and ensure on-going support from coaches and administrative staff, the chance of really affecting teaching and learning increases

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dramatically to nearly 90%. Thus, indicating that trainings and workshops help teachers to grow more and develop their professional skills (Joyce and Showers, 2002).

Awards and Recognition. Table 1 further indicates that none of the Math teachers in LNHS have received a division, regional, national and international award. However, there were 8 or 66.67% of the teachers who have received awards in the School level in the past 5 years.

Awards or Recognition is a very rewarding experience for an excellent classroom teacher and his or her students. Recognition for teachers builds some of the well-known extrinsic and intrinsic motivational theories. It offers hope for meaningful recognition to the other teachers working to improve student-learning outcomes. It also brings pride and support from the teacher's students, administration, and general public (Andrews, 2011).

Extent of Occurrence of Flanders Interaction Analysis Categories (FIAC) in Classroom

The data on the Flanders Interaction Analysis Categories which includes Accepts Feelings, Praise or Encouragement, Accepts or Uses Ideas of Students, Asking Questions, Lecture, Giving Directions, Criticizing or Justifying Authority, Student Talk Response, Student Talk Initiation and Silence or Confusion, and their respective percentage of each category occur in classroom are presented in Table 2.

Accept Feelings Category. In general, the overall extent of occurrences of this category is 3.16% of the overall teacher – student interaction. Among the 12 teachers observed the highest occurrence of accept feelings category is that of G9 – C with 5.02%. The lowest occurrence of this category is that of G8 – C with a percentage of 2.25%. Moreover, regarding the overall total percentage of talk used by the teachers in this category, implies that these teachers infrequently employ encouraging words as response to their students' complaints or difficulties.

Praise or Encouragement. The highest occurrence of this category is 4.65% of the overall interaction which is that of G7 – A while the lowest is that of Grade 10-A with a percentage of 0.41%. In addition, it is indicated that the overall percentage of occurrence of this category is 2.39% which implies that teachers rarely praise and use encouraging words that could help students' to be more motivated to learn.

Accepts or Uses Ideas of Students. This category is characterized by approval of students' ideas and teachers' ideas of the ideas of students during the discussion.

Table 2. Extent of Occurrence of FIAC in classroom

Flanders Interaction Categories													
CODE	GRADE 7			GRADE 8			GRADE 9			GRADE 10			Overall %
	A	B	C	A	B	C	A	B	C	A	B	C	
TEACHER INDIRECT TALK													
C1	2.79	2.69	3.98	3.14	2.97	2.25	4.39	2.83	5.02	2.46	2.37	3.14	**3.16**
C2	4.65	3.76	2.99	3.67	3.47	2.7	0.88	2.83	0.91	0.41	1.19	2.24	**2.39**
C3	2.79	3.23	1.99	3.14	2.48	1.8	3.51	2.36	1.37	4.1	5.53	2.69	**2.97**
C4	21.4	21.5	20.9	20.9	21.8	24.8	22.8	22.6	23.7	24.6	22.9	22.4	**22.61**
TEACHER DIRECT TALK													
C5	22.3	22	19.9	22	22.3	23.9	23.3	21.2	25.1	26.6	24.9	21.5	**23.04**

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C6	5.58	4.3	5.47	6.28	5.45	5.41	4.39	5.19	4.11	2.87	3.56	4.04	**4.66**
C7	4.19	5.38	3.48	3.14	3.96	3.15	4.83	3.77	2.28	2.46	3.95	3.59	**3.66**
STUDENT TALK													
C8	21.4	22.6	18.9	22.5	20.3	22.5	22.4	20.3	22.8	26.6	21.7	17.9	**21.73**
C9	9.3	6.45	8.46	7.33	8.42	6.31	6.58	4.72	6.85	5.33	7.91	8.97	**7.2**
SILENCE/PAUSE/CONFUSION													
C10	5.58	8.07	13.9	7.85	8.91	7.21	7.02	14.2	7.76	4.51	5.93	13.5	**8.59**
Total %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	**100%**

Legend:

C1 – Accept feelings
C2 – Praise or Encouragement
C3 – Accept or Uses Ideas of Students
C4 – Asking Questions
C5 – Lecture/Lecturing
C6 – Giving Directions
C7 – Criticizing or Justifying Authority
C8 – Student Talk Response
C9 – Student Talk Intuition
C10 – Silence/Pause/Confusion

The class with the highest occurrence of this category is G10 – B with 5.53% of all interaction while the lowest is G9 – C with 1.37%. Moreover, the overall percentage of occurrence for this category is 2.97%. This means that teachers do not often deal with the students' suggestions and develop ideas from their students' ideas.

Asking questions. This category comprises the questions raised by the teacher to her students. The teacher with the highest number of 'questions asked' is that of G10 – A with 24.6% of the total interactions while G7-C has the lowest percentage of occurrence with 20.9%. It is also indicated that this category is one of the highest occurrences and most used by the teachers with 22.61% of the overall total percentage among the first four (4) categories. This means that teachers challenge their students to learn since asking questions fosters students' alternative and more complex representation of their lessons. Moreover, asking questions is based on the teacher's ideas relevant to the content and procedures in which their students are expected to answer and participate.

Lecture. The lecture is the core of the discussion in the classroom. It is where the subject matter revolves. The occurrence of the lecture category is that of G10 – A with 26.64% while G7-C has the lowest occurrence with 19.9%. On the over-all, the lecture category has a mean of 23.04% of the total classroom interaction, the highest among the categories. This implies that the teachers are always expressing and explaining their own ideas, giving facts of opinions about the content and procedures to their classes.

. **Giving Directions.** Generally, this category comprises 4.66% in the over-all extent of occurrence. Among the 12 teachers observed, the highest percentage of occurrence of Giving Direction Category is that of G8 – A with 6.28%. The lowest occurrence of this category is that of G10 - A with a percentage of 2.87%. This category plays around the discourses of teachers with regards commands and directions. Further, the overall mean occurrence in this category implies that the teachers are not usually asking by giving orders or giving instructions to his/her students in which they are expected to comply. Possibly this is due to the result on lecture category.

Criticizing or Justifying Authority. The highest percentage of occurrence of this category is that of G7 – B with 5.38% while the lowest occurrence of this category is that of G9 – C teacher

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with 2.28%. The over-all percentage of occurrence of this category is 3.66%. This means that the teachers contribute a little amount of criticizing or justifying authority as one with the least occurrence among the first seven (7) categories. This further implies that the 12 math teachers are not used to asking his/her students or interrupting with nonsensical questions, and asking with 'WHAT' or WHY' questions.

Student Talk Response. When teachers ask questions, the tendency is that students will respond. Thus, this category is one with the highest occurrence among categories with 21.73% in the overall percentage of occurrence. Among the 12 classes observed the highest occurrence of Student Talk Response Category was observed in G10 – A with 26.64% while the lowest was in G10-C with 17.94%. Further, the overall percentage of occurrence of this category implies that students have devoted a large amount of talk compared with the other categories. Moreover, in this category, students talk response refers to teacher initiated contacts to solicit statements and allowing students to express their own ideas relevant to the lessons.

Student talk Intuition. Sometimes even without asking, the students initiate their own talk, when they need to. Among the 12 classes observed G7 – A has the highest percentage with 9.30% of total talk initiated by students, while G10 – A with 5.33% has the lowest percentage of occurrence among the classes observed. Moreover, Table 2 indicates a 7.20% of the overall total initiated talk of the students. Thus, this result implies that students from the 12 classes observed have contributed a little amount of initiated talk as their freedom to develop opinions and initiate new topics in their classes is not encouraged.

Silence/Pause/Confusion. In this category, the highest percentage of occurrence is in G9 – B with 14.2% and the lowest is in G10 – C with 4.51% of occurrence. Table 2 further indicates that the overall percentage of occurrence of this category is 8.59%. This means that teachers–students talk devoted a total of 91.41%. Thus, the result clearly implies that there is an active interaction between teacher and students during the class.

Based on the above result in Table 2, the most dominant talk categories are Lecture category followed by Asking Questions and Student Talk Response. Thus, the result conforms with the study of Nurmasitah (2010), in which the most dominant talk are direct talk under teacher talk time which means lecturing, giving directions, and criticizing or justifying authority, then the second highest is asking question which is under indirect talk category and followed by the student talk category.

Flanders Formulates Ratios

The Flanders Formulates Ratios refers to the percentages of talk between teacher-students interaction during classroom discussion, these include the teacher talk ratio, indirect talk ratio, direct talk ratio, and Student talk ratio, Silence ratio, and Indirect/Direct talk ratio. Table 3 presents the relevant data.

Table 3. Flanders Formulates Ratios of the Mathematics Classes

FLANDERS FORMULATES RATIOS						
Classroom Code	**Teacher Talk Ratio**	**Indirect Talk Ratio**	**Direct Talk Ratio**	**Student Talk Ratio**	**Silence Ratio**	**Indirect /Direct Talk Ratio**
G7-A	63.72	31.63	32.09	30.70	5.58	98.55
G7-B	62.90	31.18	31.72	29.03	8.06	98.31
G7-C	58.71	29.85	28.86	27.36	13.93	103.45
G8-A	62.30	30.89	31.41	29.84	7.85	98.33
G8-B	62.38	30.69	31.68	28.71	8.91	96.88
G8-C	63.96	31.53	32.43	28.83	7.21	97.22
G9-A	64.04	31.58	32.46	28.95	7.02	97.30
G9-B	60.85	30.66	30.19	25.00	14.15	101.56
G9-C	62.56	31.05	31.51	29.68	7.76	98.55
G10-A	63.52	31.56	31.97	31.97	4.51	98.72

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G10-B	64.43	32.02	32.41	29.64	5.93	98.78
G10-C	59.64	30.49	29.15	26.91	13.45	104.62
Mean	**62.42**	**31.09**	**31.32**	**28.89**	**8.70**	**99.35**

Teacher Talk Ratio. Teacher talks ratio refers to the percentage of all the seven (7) teacher talk categories to the overall interaction. The mean of the teacher talk ratio for all Mathematics classes is 62.42%. The highest teacher talk ratio recorded was observed in Grade 10-B with 64.43% while the lowest was observed in Grade 7-C with 58.71%.

Further, the result shows that teacher talk has the highest ratio and the most dominant among the others Flanders formulates ratios. This result is consistent with the findings of Putri (2014), with teacher talk as the most dominant classroom interaction.

Indirect Teacher Talk Ratio. The Indirect teacher talk ratio refers to the percentage of occurrence of the categories Accept Feelings, Praise or Encouragement, Accepts and Uses Ideas of Students and Asking Questions to the total number of interactions. The mean of the indirect talk ratio is 31.09%, the lowest of which is that of Grade 7-C with 29.85% and the highest is that of Grade 10-B with 32.02%.

Direct Teacher Talk Ratio. The Direct teacher talk ratio refers to the percentage of occurrence of the categories Lecture, Giving Directions and Criticizing or Justifying Authority to the overall number of interactions. The highest direct talk ratio is 32.46% which is that of Grade 9-A while the lowest is 28.86% of Grade 7-C. The mean of the direct talk ratio of all the classes is 31.32% which almost the same with the indirect talk ratio.

Further, it is indicated that both indirect and direct talk ratio which is under teacher talk, shows that indirect talk ratio is less than direct talk ratio. This means that most of the 12 teachers use direct teaching. Thus, the result does not agree on the study of Iroha Kalu (2004), that the teachers use Indirect teaching in which indirect talk obtained greatest frequency and the dominant talk in classroom interaction.

Student Talk Ratio. The Student Talk Response and the Student Talk Initiation category contributes to the percentage of the Student talk ratio. The mean percentage of this ratio is 28.89% which is almost half of the teacher talk ratio. The lowest Student Talk ratio is 25.0% from Grade 9-B and the highest is from Grade 10-A which is 31.97%.

Silence Ratio. Silence has the least occurrence with overall mean of 8.7%. Grade 10-A has the lowest Silence ratio with 4.5% while Grade 9-B has the highest Silence ratio with 14.15%. Silence measures all the pauses and confusion scenarios that occur during the classroom interaction.

Additionally, the sum of Teacher Talk Ratio, Student Talk Ratio and Silence ratio is equivalent to 100%. It is clearly indicating that Students Talk Ratio is greater than Silence ratio, this imply that students interact during class discussion. Thus, the result is consistent based on the study if Iroha Kalu (2004), that students talk has the greater amount compared to the silence category.

Indirect-direct talk ratio. The Indirect-direct talk ratio compares the level of indirect and direct talks. When the ratio is higher than 100 percent, the indirect talk dominates than the direct talk. When the ratio is lower than 100 percent, the direct talk dominates than the indirect talk. The highest of this ratio is 104.62% from Grade 10-C which means that the teacher use more indirect talks than direct talks. The lowest of this ratio is 96.88% from Grade 8-B which means that this class has more direct talks than indirect talks.

This result does not agree with the study of Iroha Kalu (2004) that the indirect talk ratio is greater than direct talk ratio. The use of direct talk Lecture, Giving Direction, Criticizing or justifying authority is associated with autocratic while the use of indirect talk is associated with democratic teaching. The result clearly shows that teachers still rely on autocratic teaching as majority of the teachers used direct talk rather than indirect talk.

Students' Mathematics Performance

The Students' Mathematics Performance was categorized as Outstanding, Very Satisfactory, Satisfactory, and Fairly Satisfactory and did not meet the expectation. Table 4 presents the distribution of the students by level of performance.

Table 4 shows that the overall mean of all classes combined was 84.28 described as ''Satisfactory''. This means that, in general, students in 12 classes observed have achieved a satisfying grade in mathematics subject.

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Table 4. Distribution of Students' Mathematics Performance

Students' Math Performance	f	%
95 – 100% (O)	21	4.62
85 – 94% (VS)	242	53.19
80 – 84% (S)	91	20.00
75 – 79% (FS)	41	9.01
75% Below (DNME)	60	13.19
Total	**455**	**100.00**
Overall Mean	**84.28 (Satisfactory)**	

Legend:
O – Outstanding
VS – Very Satisfactory
S – Satisfactory
FS – Fairly Satisfactory
DNME – Did not meet Expectation

Further, considering the result of students' distribution in Mathematics Performance, Table 4 shows that majority of the students (242 or 53.19%) have 'Very Satisfactory' level of performance. On the other hand, only (21 or 4.62%) have 'Outstanding' level of performance. Moreover, 91 or 20% have satisfactory performance level; (41 or 9.01%) have fairly satisfactory level of performance; and (60 or13.19%) have not met expectation. This further indicates that 77.81% of the students have a performance level of satisfactory or better which implies that majority of the students perform well and have satisfactory level in Mathematics performance.

Relationship between the Teachers' Profile Variables and the Extent of Occurrence of Flanders Interaction Analysis Categories in Classroom

In this study, the relationship of Teachers' Profile Variables to the Extent of Occurrence of Flanders Interaction Analysis Categories (FIAC) in classroom was determined. Table 5 presents the relevant data.

As shown in Table 5, the profile variables Age, Sex, and Year in Teaching Profession, and the Awards and Recognition are not significantly related to the extent of occurrence of Flanders Interaction Analysis Categories. This is indicated that the r – values ranging from -0.505 to 0.559 with p – level higher than the significance level set at 0.05.

Table 5. Teachers Profile Variables and Extent of Occurrence of FIAC in Classroom

CODE	AGE		SEX		YEARS IN TEACHING		EDUCATIONAL ATTAINMENT		TRAININGS		AWARDS AND RECOGNITION	
	r-value	p-level	r-value	p-level	r-value	p-level	r-value	p-level	r – value	p-level	r-value	p-level
C1	-0.023	0.944	-0.343	0.275	-0.073	0.823	-0.077	0.812	-0.185	0.564	0.188	0.558
C2	-0.105	0.745	0.367	0.24	-0.247	0.438	-0.563	0.056	-0.068	0.833	-0.369	0.238
C3	-0.27	0.396	-0.122	0.705	-0.095	0.768	-0.307	0.331	0.029	0.929	-0.235	0.463
C4	0.323	0.306	0.073	0.821	0.417	0.177	**.666***	**0.018**	0.302	0.341	0.402	0.195
C5	0.309	0.329	0.122	0.705	0.424	0.169	0.461	0.132	0.535	0.073	0.559	0.059
C6	0.126	0.696	0.171	0.594	-0.088	0.785	-0.512	0.089	0.119	0.714	0.101	0.756
C7	-0.474	0.12	-0.024	0.94	-0.505	0.094	**-.666***	**0.018**	-0.226	0.479	-0.346	0.27
C8	0.263	0.409	0.318	0.313	0.368	0.24	0.358	0.253	0.323	0.305	0.469	0.124

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C9	-0.288	0.364	-0.22	0.491	-0.375	0.23	-0.205	0.523	0.183	0.569	-0.171	0.594
C10	-0.147	0.648	-0.122	0.705	-0.251	0.432	-0.205	0.523	**-.686***	**0.014**	-0.406	0.19

*Correlation is significant at the 0.05 level (2 tailed)

Legend:

C1 – Accept feelings
C2 – Praise or Encouragement
C3 – Accept or Uses Ideas of Students
C4 – Asking Questions
C5 – Lecture/Lecturing
C6 – Giving Directions
C7 – Criticizing or Justifying Authority
C8 – Student Talk Response
C9 – Student Talk Intuition
C10 – Silence/Pause/Confusion

On the other hand, the profile variables Educational Attainment and Trainings are significantly related to the extent of occurrence of FIAC. Specifically, a significant and positive relationship between Educational Attainment and the Teacher Asking Questions with r – value of 0.666 and p – level at 0.018, but negatively related to Teacher Criticizing or Justifying Authority with r – value of – 0. 666 and p – level at 0.018. Moreover, Attendance in Trainings is significant but negatively related to Silence Category with r – value of – 0. 686 and p – level at 0.014 was found. Thus, the corresponding null hypotheses were rejected.

This further imply that among teachers have who pursued Master's Degree or Graduate Studies, the asking questions technique which is under Teacher indirect talk tend to increase. However, criticizing or justifying Authority tend to decrease in the mathematics classes. Moreover, a teacher with more trainings tend to become more capable to manage the class to have an interactive and participative in the classroom setting where the students become motivated to interact in Mathematics class discussion.

Relationship between the Students' Mathematics Performance and
Flanders Formulates Ratios

In this study, the relationship of Students' Mathematics Performance to the Flanders Formulates Ratios was determined. Table 6 presents the relevant data.

As shown in Table 6, the students' Mathematics performance is not related to the Flanders Formulates Ratios. Specifically in terms of Indirect Talk Ratio, Students Talk Ratio, and Silence Ratio. This is indicated that the r – values ranging from -0.573 to 0.497 with p – level lower than the significance level set at 0.05.

Table 6. Students' Mathematics Performance and Flanders Formulates Ratios

Flanders Formulates Ratios	**Students' Mathematics Performance**	
	r- value	**p-level**
Teacher talk ratio	**0.615**	**0.033***
Indirect Teacher talk ratio	0.497	0.101
Direct Teacher talk ratio	**0.671**	**0.017***
Student talk ratio	0.392	0.208
Silence ratio	-0.573	0.051
Indirect/direct talk ratio	**-0.729**	**0.007***

*Correlations significant at the 0.05 level (2 tailed)

On the other hand, the students' Mathematics performance is significantly related to the Flanders Formulates Ratios. Specifically, a significant and positive relationships are observed between students' Mathematics performance and Teacher Talk Ratio with r – value of 0.615 and p – level at 0.033, Direct Talk Ratio with r – value of 0.671 and p – level at 0.017. However, a significant but negative relationship between students' Mathematics performance and Indirect/Direct Talk Ratio with r – value of -0.729 and p – level at 0.007 were found. Thus, the corresponding null hypotheses were rejected.

This further imply that students have higher performance in Mathematics when teachers contribute more talk with the use of direct teaching

to communicate knowledge in facilitating Mathematics class in the teaching learning process.

Moreover, this result does not agree with the study of Iroha Kalu (2004) that found a significant and positive relationship between Teacher Indirect Talk and students' performance.

IV. Conclusion

In the light of the above findings, it was concluded that the mathematics teachers are 'Middle Age'. Mostly females 'moderately experienced', teachers with Master's units, attended division and regional level trainings, with few awards and recognitions. Teacher talk particularly direct lecture is the most dominant Flanders Interaction Analysis Categories (FIAC). The highest of the Flanders Formulates Ratios in classroom interaction is the teacher talk ratio with the teacher direct ratio greater than the teacher indirect talk ratio. The Students' Mathematics Performance is at the satisfactory level. Teachers' Profile is significantly related to the Extent of Occurrence of Flanders Interaction Analysis Categories (FIAC). Specifically, teacher with higher educational attainment tend to ask students more questions and avoid criticizing or justifying authority. Moreover, students of better trained teachers tend to be more vocal in class participation. The Students' Mathematics Performance is significantly related to Flanders Formulates Ratios.

V. Recommendation

The following recommendations are offered based on the conclusions of the study:

Teachers are encouraged to attend trainings/workshops in different levels like national and international level. They should also be intrinsically motivated to earn awards and recognition not only at the school or local level but also at the national and international, if possible.

1. Teachers are encouraged to pursue and finish their Graduate studies to deepen their insights on subject areas knowledge and have the opportunity to apply new concepts and methodology that may help them improve teaching.
2. Mathematics teachers are also encouraged to adopt direct verbal teaching. In addition, teachers should update themselves with the 21st century skills in the teaching learning process. It is also important to practice and demonstrate in class discussion the FIACS categories accepting feelings, using their ideas and praising or encouraging our students' so they will be more motivated.
3. Mathematics teachers may provide students' opportunities for both practice and discovery of ideas to construct knowledge in Mathematic to increase the performance.
4. A study be conducted on Classroom Interaction Analysis and Students Academic Achievement in Mathematics at least two (2) grading period or even the whole Academic year.
5. A study be conducted on Classroom Interaction Analysis and Students Academic Achievement in Mathematics including the relationship of the teachers' performance and other profile variables to the extent of occurrence of FIAC in classroom.
6. A study be conducted on Classroom Interaction Analysis in relation to Students Academic Achievement in other subjects like languages, Social Sciences, technical subjects, Humanities and others Sciences.

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