ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

GENDER DIFFERENTIATION REFLECTED IN SECONDARY SCHOOL TEACHERS' BEHAVIOUR DURING CLASSROOM INTERACTION AND ITS IMPLICATIONS TO THE ACADEMIC STATUS OF FEMALE STUDENTS:WITH SPECIAL REFERENCE TO REGION THREE

YESHIMEBRAT MERSHA

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This thesis has been submitted for examination with my approval as university Advisor.

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BY
YESHIMEBRAT MERSHA

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ACRONYMS

Abbreviations Which Appear in the Text are Stated as Follows

FIAC	Flanders Interaction Analysis Category
FIAT	Flanders Interaction Analysis Technique
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNICEF	United, Nations, Children's Fund
MOE	Ministry of Education
CSA	Central Statistical Authority
TT	Teacher Talk
PT	Pupil Talk
SC	Silence and Confusion
TQR	Teachers' Questioning Ratio
TRR	Teachers' Response Ratio
PIR	Pupil Initiation Ratio
ITT	Indirect Teacher Talk
DTT	Direct Teacher Talk
I/D	Indirect/Direct Ratio
VTB	Verbal Teaching Behaviour
ESLCE	Ethiopian School Leaving Certificate Examination

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DEDICATION

This work is dedicated to my children Hiwot, Bisrat, Atsede, Eleni, and Danail in honour of their tolerance when their mother has been studying away from home for so long.

ABSTRACT

The purpose of this study was to analyse the gender differentiating verbal teaching behaviour of teachers reflected during classroom interaction in region three secondary schools.

To this end, descriptive survey method was employed in the study. Fourteen teachers and 564 male and 516 female students were taken as samples of the study from fourteen secondary schools selected on the basis of criteria. A slightly modified Flanders' Interaction Analysis Technique was employed in the data collection process so that notes could be taken for boys and girls separately during pupil-teacher classroom interactions. The data obtained using FIAT were analysed by using percentile, ratio, and different statistical methods like t-test and chi-square.

Results of the data analysis indicated that the teachers accepting of pupil feelings and using their ideas, response, questioning, giving directions, criticizing and justifing authority, pupil-talk response, and pupil-talk initiation showed significant difference in relation to boys and girls in the classroom interaction. The analysis of teachers application of FIC also indicated significant variations in relation to students sex.

On the basis of the findings, therefore, it was recommended that schools and concerned people should sensitize teachers and female students about the gender differentiation reflected in secondary school teachers' verbal teaching behaviour during classroom interaction. Evaluating and revising pedagogical and psychologycal courses, in-service training, and further research work were important measures to be given due consideration in addressing the problem.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Discrimination of a very subtle nature is perpetrated against class, sex, and race on our earth. One form of discrimination is evident in the process of socializing on the basis of sex. Especially the school becomes, next to the home, a breeding ground for sexual inequality that takes place while socializing the young into femininity and masculinity (UNESCO, 1979 and Saroup 1978, Barbara and Subbarao 1991).

Schools have a powerful limiting influence on the development of appropriate sex; roles, they define specific attitudes, modes of acting and opportunities which are appropriate for boys and girls. These school practices limit the opportunity of open choice for each sex to learn according to their potential and interest. They also inculcate a sense of inadequacy when individual students do not line up to the socially defined norms (Saario, 1979).

In this regard, Megarry (1984: 22) reports her observation of the bias of education in its discriminating practice and says:

> There is evidence all over the world that educational systems exaggerate the effects of sex differences and do so in ways which limit the educational opportunities of females in particular. Gender typing recures in the official curriculum, teaching materials ... subject choice, teaching behaviour ... and in the hidden curriculum of the traditional assumptions and codes of behaviour.

This condition is evident in different countries' educational systems as indicated in UNESCO and World Bank reports. For example, according to UNESCO's (1979) and World Bank's (1995) reports, in most countries females' participation in education at all levels is low compared to that of males. Girls repeat and dropout more frequently than boys. In higher educational institutions females constitute only one-third of the whole

student population. Moreover, girls are proportionally smaller in number in technical fields and they study fields that most often prepare them for low economic status jobs. This condition is specially prevalent in the developing countries of Latin America, Asia and Africa. The practice is also observed in Ethiopian schools. From all of the above facts, one can conclude that the educational sector is by no means perfect in the provision of equal opportunities to male and female students.

The effect of the gender discriminating practice between male and female students in the educational process not only restricts females' participation and performance in schools, but also limits the levels, types, and areas they participate in the educational system as well as in the society. The problem should therefore not only be considered as an obstacle for female advancement, but also as an impediment to the progress of society (Okoye, 1987, and Prather, and Balouch, 1996).

A number of results of research reviewed on the problem indicate the constraints to be the curriculum, instructional materials and the subject choice. However, Kyriacou (1992) and ICDR (1995) stressed that in discriminating between male and female students, specially in classroom practice, the teacher's behaviour should be seen as a major factor. Particularly the teacher's verbal teaching behaviour has a great impact on the learner to bring about the intended behavioral change in the pupil-teacher classroom interaction. Thus, the teacher's verbal teaching behaviour should be investigated in depth.

Of course, teachers are not primary agents in influencing role patterns. Nevertheless, teachers reinforce patterns of sex-role learning that are observed in schools. This is clearly indicated in Renzetti and Curran (1989) showing that in every classroom there exist unofficial curriculum, that varies from the learning experience that is determined by the teacher's attitude and behaviour rather than by formal syllabus. In regard to sex typing, much of this unofficial curriculum is "hidden"; teachers themselves are unaware of their own expectations and behaviours of teaching that effectively sustain and reinforce conformity to sex-role stereotyping in classroom interactions.

Different studies conducted on teacher's classroom behaviour in various levels of schooling confirmed that teachers perceived boys and girls differently. For instance, they consider girls as dependent in academic matters though they have creative skills, while boys are viewed as independent and superior (Motta and Vane, 1977, and Simons, 1980).

Regarding this point, based on data from different countries' educational, experiences, UNESCO (1984: 281) reported that:

1. Teachers spend more time talking to male than female students.
2. Girls have to wait longer time for answers or assistance.
3. Teachers know a great deal about boys than girls.
4. Teachers prefer to introduce topics which usually are associated with males.
5. The majority of teachers prefer to teach boys even though they are assigned to teach girls.
6. Teachers have different expectations for male and female students.

Stow and Salfe (1989: 73) stressing the effect of teachers 'discriminating behaviour' had this to say! "sex differentiating teachers' treatment of girls and boys may lead to an erosion of confidence and develop a negative attitude towards school and learning which may result in chronic student absenteeism and repetition."

Although boys and girls learn or are expected to learn in some-what different ways and treated differently by their teachers, available evidence clearly indicates that explaining differential levels of achievement on the basis of sex is unreasonable. This is because performance differences between the sexes are for the most part learned behaviours (Megarry, 1984).

When we look at the problem in the context of our country, local research on analysing classroom verbal interaction is limited. Abdulkadir (1983) Mccoul (1994) and Abdulaziz (1997) analysed pupil teacher interaction in 12^{th} and 9^{th} grades English, Mathematics and Geography classes respectively. In addition Tassew (1992), analysed the situation of teacher trainees in science classes in relation to their intelligence, self concept and attitude towards teaching. Except for these, studies analysing gender

differentiation in classroom interaction and its implications on female students' academic status in physics classes have not been done.

Therefore, the condition requires a thorough research on pupil-teacher interaction in classroom instruction. Moreover, investigating the major constraints that cause the inferior status of female students in the instructional practice is very timely. Such a study may shade light on the current status of the educational practice in Ethiopia.

1.2 Statement of the Problem

As statistical data of the World Bank (1997), UNESCO (1997), and MOE (1996) show, the number of boys in primary and secondary level exceed that of girls in Ethiopia. Moreover, the participation of female in diploma, degree and postgraduate levels is low compared to that of males.

It is not just disparity between the two sexes, but girls are limited to some fields considered as feminine areas. Specially, girls' participation in the sciences is low, and particularly in physics it is almost nil (MOE, 1993/94). For instance, in 1993/94 academic years in Addis Ababa University, female participation in science is observed in a ratio of biology 34:3 and chemistry 41:2 and physics 24:0. This could be explained partly as resulting from the assumption that science and specially physics is a masculine area (Useem, 1992).

In secondary level the dropout rate of boys is by far lower than girls. The highest number of repeaters at all school levels are also girls. Moreover, in Ethiopian schools regarding the academic performance of female learners, Assefa (1991) Anbessu and Barbara (1988), and Genet (1991) show in their studies that girls have comparatively lower participation and performance than boys in school practices. This clearly reflects, therefore, an imbalance between the two sexes in the educational system.

This leads us to look seriously for factors in the instructional practice which possibly negatively influence the academic performance of female students. The problem

needs deeper investigation of those aspects of the instructional practice that could perpetuate traditional sex roles, specially in pupil-teacher verbal classroom interaction.

However serious the problem is, no effort has been made to study the influence of gender differentiation reflected in teachers' teaching behaviour during classroom interaction. Therefore, it is felt important to investigate in depth the attention given to male and female students during classroom interaction using Flanders Classroom Interaction Model.

For this study, on the basis of relevance, out of the ten Flanders' categories only eight are selected for the analysis. The other two lecturing (category 5) and silence and confusion (category 10) are included by giving equal weightys in their (5-5) and (10-10) cells for both sexes due to their lack of relevance in showing gender differentiated teaching. The categories involved in the investigation are accepting feelings (category 1), praises and encourages (category 2), accepts or uses pupil's ideas (category 3), asks questions (category 4), gives commands or directions (category 6), criticizing or justifying authority (category 7), pupil-talk response (category 8), and pupil-talk initiation (category 9).

In investigating the problem, the following research questions were formulated to be answered in the course of study.

1. Are the selected Flanders' categories equally applied by the teacher to boys and girls during classroom interaction?
    a) Does the teacher respond to male and female students' expression of feelings equally (category 1)?
    b) Does the teacher encourage or praise both sexes equally (category 2)?
    c) Are the ideas of both male and female pupils' accepted and used by the teacher in a balanced manner (category 3)?
    d) Does the teacher equally ask questions to both male and female students (category 4)?
    e) Are the teacher's commands or directions given to both sexes

similarly (Category 6)?

f) Are the teacher's criticism and justification of authority expressed in similar ways to both boys and girls (category 7)?

g) Does the teacher provide equal opportunities in responding to boys and girls answers (category 8)?

h) Does the teacher respond to initiation of boys and girls equally (category 9)?

2. Is there any sex bias difference reflected in the classroom behaviours of male and female teachers towards male and female students during classroom interaction?

1.3 Objective of the Study

The study is targeted to achieve the following basic objective:

- To investigate the major categories of secondary school teachers' behaviour which directly or indirectly influence female students in 9th grade science specially in physics during classroom interaction.
- To identify components of teachers' behaviour in classroom interaction that influence gender differentiated instruction.
- To find out the relation between the sex of the teacher and the interaction with male and female students in classroom interaction.
- To pinpoint factors that negatively influence the female students in interacting with their teachers in classroom instruction during physics classes.

1.4 Significance of the Study

As indicated earlier, the study is designed to examine the constraints impeding the free interaction of female students with their teachers in classroom instruction during physics lessons. Therefore, the findings of such a study could provide essential data that could be employed:

- In developing appropriate strategies and measures to address the factors that have been affecting female students' free interaction with their teachers in physics lesson.
- To provide insight for policy and decision makers, teacher trainers, and authorities concerned with the magnitude of the problem and help to gear teacher training to better classroom interaction methods that could involve both sexes equally in physics instruction.
- To indicate possibilities that could help in raising the participation and performance of female students in science lessons and provide a solution to minimize the current female students' problems in Ethiopian schools.
- To use as a steping stone by researchers who would like to further investigate similar or related problems.

1.5 Delimitation of the Study

The emphasis of this study is on gender differentiating teachers' verbal teaching behaviour exhibited in classroom interaction of selected 9th grade secondary school of physics instruction in Region Three using Flanders' classroom Interaction Analysis Model (FIAC).

Of the four grade levels of senior secondary school, grade 9 is selected on the basis of MOE (1993/94) statistical data which reflected high percentage of girl repeaters in secondary level. The classroom interaction in science, specially in physics classes, in grade 9 level is selected due to the low participation of female learners in science and considering the importance of science to the country's development (MOE, 1993/94). In addition grade 9 science syllabus with all its aspects starts at this level and the level is the basis for higher education science.

Region Three is selected for it is one of the regions in which female repeater rate is high in the secondary level (MOE, 1993/94).

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1.6 Limitation of the Study

The absence of female physics teachers as primarily intended, based on the Regional Education Bureau statistics that showed the presence of two female physics teachers in the region, the delay of the approval of the research proposal, and shortage of recent materials in Addis Ababa University libraries such as journals and books related to the work were the major constraints of the study. Moreover, the long time taken to release the research fund and lack of electric power in some sample secondary schools to record the classroom interaction were the other severe problems faced during the study.

However, the investigator tried to solve the problems by devising different mechanisms. For instance, making all the sample teachers male, and using CD-Rom service however, its services are limited to get recent relevant materials as intended, and requesting Camera-man and video sound recorder from different colleges and institutions to some extent free of charge, and using battery operated tape recorders in schools without electric power.

1.7 Definition of Key Terms

- **Gender:** It is a learned attitude and socially determined sex role behaviour and usually divided into masculinity and feminity, due to the expectation people have from someone who is female or male (Mackenzie, 1993).
- **Sex:** The biologically determined physical distinction between female and male (Mackenzie, 1993).
- **Gender Differentiation:** The act of distinguishing female and male students to form a new character and practice in schools following the traditional sex role division. (Renzetti, 1989).
- **Classroom Interaction:** The chain of events which occur one after the other, in an instructional practice (process) during pupil-teacher communication of ideas. (Flanders, 1970).
- **Classroom Interaction Analysis:** The way of coding the verbal classroom events

with special attention to the teacher's verbal behaviour to decode and analyse the nature of classroom interaction between pupil and teacher (Flanders, 1970).

Teaching Behaviour The direct and indirect influence of the teacher in the teaching learning event. The direct is expressed in events like lecturing, giving directions and criticizing and justifying authority. The indirect is observed in encouragement, accepting feelings, using pupils ideas, and questioning (Stone and Morris, 1972).

CHAPTER TWO

REVIEW OF RELATED LITERATURE

In this chapter it is intended to present a review of related studies on gender differentiating teaching behaviour in general. Based on different scholars who gave due consideration to the importance of teaching behaviour and its effect in the instructional process in classroom interaction, important issues are presented in detail. In addition, studies relevant to gender differentiation in science teaching specially in physics, the direction of local studies in relation to FIAC on the problem, and the academic status of female students in Ethiopian schools have been reviewed.

2.1 Teaching

2.1.1 Teaching As A Concept

Noted writers in the field of education defined teaching in various ways. Some defined it as decision-making, while others consider it to be guiding or directing. Still others view teaching as a designed act that brings a behavioral change in the learner. In order to understand the concept of teaching in a wider scope, there is a need to go through the various definitions and put them in some related categories.

Teaching in former days was defined by some scholars as only an art. For instance, Highet (1954) defined teaching as an art and warned of the danger of applying the aim and method of science to teaching which cannot be systematically appraised or employed to human values which are quite outside of the grasp of science. Moreover, he tried to show the difference between teaching and testing chemical reactions in that teaching in his view has only an artistic nature more like painting, composing, gardening, or letter writing.

Gage (1967) and Gallargher (1963) went against the above contention of viewing teaching as merely an art and showed that teaching has also a scientific ground. They argued that however teaching requires artistry and some of its nature gives allowance for

the individual teacher's interpretation and innovation, it has inherent order and lawfullness that can be subjected to theoretical analysis and this reflects its scientific nature.

In the same vein Sharma (1990) views teaching as having a systematically designed scientific nature and actions that could produce learning. Teaching is also seen as an intended activity that provides pupils' various activities that would bring about a behavioral change in the learner. It involves interactions and classroom talk between pupil and teacher that contains a two-fold influence. In the process teacher and pupil influence each other on their behaviour. The behavioral change and influence is due to a series of events (patterns of teaching behaviour) that involves verbal interaction and communication targeted at changing the learner's behaviour (Gage, 1978, Flanders, 1970 and Chauhan, 1979).

As many research scholars in the field indicated, the study of teaching has received a wide and close attention due to the basic nature of teaching behaviour that negatively or positively influences pupil learning (Tassew, 1993, Flanders 1970, and Stone and Morris, 1972). Thus, this in turn implies that researchers should probe deeper to understand teaching and teaching behaviour and investigate the constraints that affect it and develop a wider knowledge that could be applied to facilitate teaching (Taeger cited in Bellon et.al 1992: 4).

2.1.2 Teaching Behaviour

Teaching is a complex task and such some educators in the field point out specially the difficulty of defining it and cite particularly the behaviour associated with excellence in teaching. The difference in this instance arises due to the relevance of various factors coming into play in every instance of instruction and for every teacher (Potter, 1987: 1).

Ryans (1960) defined teaching behaviour as the different activities performed by the teacher in the teaching learning process such as guiding, decision making or directing in attaining instructional objectives. Medly (1982), along the same line, viewed teaching in relation to the performance of the teacher displayed in classroom interaction.

Teaching behaviour is considered by Flanders (1970) as a chain of events performed by the teacher during classroom interaction. The teacher interacts with individuals and groups in guiding the instruction. In this condition, every teacher displays a particular teaching behaviour which intentionally (planned) or unintentionally (unplanned) influences the teaching behaviour. In this way it has a great impact on the learner's academic progress and performance.

The above definition implies that teaching behaviour is relative both in its effect and as it appears in a social setting. Its relativeness is reflected by the different effects that are expressed in its effectiveness or ineffectivenss or its negative or positive influence on the learner. Its social character is also reflected in the necessity for the presence of learners for the interaction.

Good and Brophy (1987: 116) stated that teachers' behaviour is affected more than other things by their beliefs, attitudes and expectations. Asheton (1990: 1) noted also that teachers regardless of their service years and even at preservice stage, do hold implicit beliefs about students, the subject they teach, and their teaching responsibilities. Thus, these beliefs and attitudes in turn influence their reaction to their students and their teaching behaviour Asheton (1990: 51), citing Blaton concluded that there is a clear relationship between teacher beliefs, attitudes, and their teaching behaviour.

Teaching beliefs and attitudes are shaped by various factors, among which are the influence of sub-culture and preservice experience (Fang, 1996: 50). Teachers beliefs and attitudes in practice can take many forms, they can be embodied, among others, in teachers' expectations of students performance or in their teaching behaviour. Regardless of their forms these teachers' beliefs and attitudes can affect the teaching behaviour in one way or another (Cooper and Tom, 1984: 78). They stated that these beliefs and attitudes are formed prior to their interactions with the students or at the beginning of the term. The teacher develops a firm stand about a particular student before he/she has had a chance to gather information.

Studies on teaching behaviour by Brophy and Good (1970:137) showed that

teachers develop rigid stereotype perceptions and expectations about their students based on prior impressions. They tend to treat their students as sterotypes rather than individuals. Moon (1994: 139) citing Parody and Good adds that some teachers being unaware of their own behaviours show considerable differences in interacting with boys and girls during their instruction.

In Raudenbush's (1984: 85-97) review of eighteen research findings, teachers' expectation effects had been found to increase by grade level. For most of the students, the expectation effects become stronger at grade seven, nine and the first year of college and graduate school. Thus, the effect is stronger whenever students are new to institutions and to the teacher.

Similarly, results of research regarding teachers' expectation and its effects on first grade language teaching on boys and girls by Beez, Schrank, and Parady cited in Good and Brophy (1987: 118) showed a clearcut positive result to teachers expectations in that boys were viewed as high achievers and girls as low achievers. This teachers behaviour created self-fullfilling prophecy on the learners. Outcomes of teachers consistent expectation in classroom interaction, according to Braphy and Good (1970: 368) are the following:

- Teachers who are consistent with differential expectations behave differently towards students due to their gender, achievement, race etc.
- The differential treatment tells students something about how they are expected to behave in the classroom on academic tasks.
- When the teacher's behaviour is consistent overtime, and students do not actively resist or change it and it will likely affect their self-concept, achievement motivation, level of aspiration, classroom conduct, and interaction with teachers.
- These effects will complement and reinforce teachers' expectation, so that students will conform to these expectations.
- Ultimately, this will affect students' achievement and other outcome measures. High expectation students will be led to achieve near their potential, but low expectation students will not gain as much as they could

have gained if thought of differently.

Capel (1995: 97) has this to say about the effect of teachers' expectations:

> Theory of motivation tells us expectation effects reflected in teachers' behaviour influence the way pupils perform, their motivation to learn and how they attribute success or failure and moreover influence the pupils to perform in the way they are expected.

The facts so far reviewed reflect that teachers behaviour is highly influential on the quality and quantity of pupil learning. It obstructs or enhances the participation and performance of both sexes in the instructional process. In addition to their discriminating behaviour on the basis of gender may have a serious effect upon the academic progress and social development of the sexes segregated. Since the direct person-to- person contact and the more indirect teacher influence in the instructional event is curcial (Flanders, 1970: 3), classroom interaction is very important and it is essential to investigate what is happening in the classroom with regard to the types of treatment given to boys and girls.

2.1.3 Verbal Teaching Behaviour

Verbal teaching behavior includes all the verbal acts of the teacher which occur in classroom interaction. According to Capel (1995: 83), verbal communication is understood as lecturing, questioning, praising or criticizing pupil. Teacher's talk is categorized by Flanders (1970) either as direct or indirect teaching behaviour. Both direct and indirect teaching do have a place in good teaching.

2.1.3.1 Direct Teaching Behaviour

It is a highly structured expository teaching that mostly focuses on academic content. Its features are lectureing, explanation, giving directions, and other highly teacher-directed activities (Callahan, 1988: 11).

2.1.3.2 Indirect Teaching Behaviour

Includes teacher talk that indirectly influences pupil. It is characterized by teachers reliance on accepting students feelings, asking questions, acknowledging pupils' ideas, providing praise and encouragement to pupil (Perrott, 1982: 2).

2.1.4 Non Verbal Teaching Behaviour

Non-verbal teaching behaviour includes gestures, nodding, facial expression, casual glance at students, etc. (Stones and Morris 972: 201). Non verbal communication has an impact on pupil learning. In a classroom instruction, since the bulk of the teacher's teaching is verbal it is inevitable that verbal communication will predominate. However, it is stressed that the non-verbal one also should not be overlooked (Stone and Morris, 1972: 87).

2.2. Research Trends on Gender Differentiated teaching Behavior

Gender is not, like sex, a biological or physical difference between the two sexes. But it is the expectation people have from a person because she or he is male or female (Meckanzie, 1993: 16). Yet, the fact is that gender difference is quite observable every where and that creates the expectation of masculinity or femininity in a society varies in accordance with the culture. That is, because gender is a social creation not a biologically given difference between the two sexes (Renzetti and Curran, 1989: 4).

The traditional beginning of the gender differentiating teaching behaviour can be ascribed to such phrases as "Good morning boys and girls," that reflects the teacher's perception of male and female students as vastly different creatures. Consequently much of the teacher's methodology, from lining the children up into male and female rows, streaming them into sex stereotyped subject areas, organizing different male and female work groups in the same classroom, putting different standards of excellence particularly in science, mathematics and physical education and even different greetings and language patterns are some of the perceived differences displayed by teachers towards boys and

girls in the school setting (Diller, 1996: 39).

Schooling, from its ancient beginning, viewed female and male education differently. In ancient schools, only upper class women were taught at home. What they learned was far more restricted than knowledge imparted to men. The main aim of the teaching and the subject matter taught to these women was to better prepare them for their roles in the society, like to be well-groomed partners for their elite husbands, witty and demure, it was not aimed to enable them for public leadership (Renzetti and Curran, 1989: 83).

Modern education seems to have taken traditional educational view "sufficiently and seriously" and thus gender differentiation can be found in every part of the world institutionalized at all levels of schooling (Diller, 1996: 65). Howe (1984) stated that girls usually undergo different educational experiences and are mostly channelled into different areas of study. Boys specialize in fields such as engineering, physical and natural sciences, law and medicine. Girls, in contrast, mostly study home economics, nursing and secretarial sciences.

The most critical person in the school in charge of teaching is the teacher. Teachers, like the other members of the society, are socialized personally on the basis of sexist assumption of values. Their beliefs and attitudes in regard to sex is affected by their previous socialization, and, as a result, the students are affected by teachers' stereotyped behaviours (Sadker, 1975:320).

A good deal of the findings of research conducted at different levels of schooling by Brophy and Good (1970), Potter (1987) confirmed the above facts that boys and girls, due to teachers attitudes and beliefs, do get different feedbacks from their teachers. These findings further showed that boys were socialized to be aggressive and independent whereas girls were socialized to be passive and dependent. Boys also get more attention, praise and interaction than girls from their teachers. Moreover, teachers provide detailed step by step directions on how to solve problems for boys than for girls. When so doing, teachers in these studies were found to be unaware of their teaching behaviours. Thus,

it should be obvious at this point that the different treatment given to boys and girls hurts boys as much as it hurts girls. Because in the differentiated teachers' treatment, boys are not socialized in the normal way, they are guided to adhere to gender stereotyping and learn to do certain things that is only masculine.

In addition, different studies on teachers behaviour towards male and female students have found that teachers criticize only the misbehavior of boys whereas girls are criticized anyway and unrewarded for academic performance (potter, 1987). In this regard, Sadker and Sadker and Dweck citd in Renzetti (1989: 78) showed that teachers mostly provide remedy for the problems of boys and challenge them in academic matters. Teachers help boys to find their errors and challenge them to try and find possible means of improving their academic achievements than girls. Boys get more praise and encouragement for their academic quality, whereas girls are praised more often for the neatness of their work. Moreover, girls seeking to interact and forward ideas are not rewarded, even intentionally. Owing to this, girls have fewer self-initiated oral participation in classroom interaction. Girls and boys are also found to be provided, within these studies, different classroom chores. For instance, girls were dusting desks, watering plants or writing laboratory results while the boys were rearranging and manuplating equipment or testing chemicals. In this way, girls are deprived of the valuable experiences of independent learning through doing.

In a similar study, Wolunsky and Lee (1974: 349) found out that female teachers were slightly different in interacting with boys and girls. Male teachers were more inclined to boys, whereas female teachers were more interested in girls. In addition, female teachers were found to be disapproving towards boys than towards girls while the opposite was observed on male teachers.

Clark (1995: 322) stressed the importance of pupil-teacher classroom interaction as being a fundamental one to the students' academic progress:

> There is a great dependency on the teacher building up confidence, and showing them that they can do it, and they can make a progress. And if you do not get the relationship right, then the pupil can switch off. And then once that switching off has started and set in them, you find it very difficult to pull them back.

However, gender differ ences in intellectual functioning reviewed in the literature are quite small. Thus, there is no reason to believe that boys and girls cannot succeed equally well in different school subjects or subsequently in different vocational fields (Hyde et.al cited in Good and Brophy, 1987: 32).

Speculations and research efforts concerning gender differences in cognitive ability, particularly in mathematics and special abilities, are observed in different literature. A few consistent gender differences have been found for verbal abilities between boys and girls (Mills, 1993: 340). However, these general statements on gender differences in intellectual ability are likely to be misleading because they mark the complexity of the issue, for instance, the age at which gender differences first appear and the direction of such differences differ from one study or review article to the other.

The generalization of all these findings, however, is challenged by the observation of some authors that gender-related differences in cognitive ability have declined during recent years (Emannesson and Suensson, 1986: 25, Hyde et.al, 1990: 139, and Linn, 1991). In addition, Mills (1993:342) pointed out that gender differences in mental ability between the two sexes may represent constraints on equal representation of the two sexes in different areas of study, and may result from motivational factors due to social experiences and expectations.

Good relationship between the teacher and the pupil in classroom interaction is vital in the give and take process of classroom life. The daily interaction of pupil with their teacher in their classrooms is crucial in positively influencing pupil behavioral development, his/her intellectual and moral development, as well as adjusteing their mentality well (Cohen, 1977:228). The child needs to be treated as someone who is important in his/her rights and not just as a member of a category. For children to develop and function as persons, they need help in developing the kind of self-concept

that allows them to regard themselves as important citizens in a society (Daweney cited in Cohen, 1977: 229).

So sex stereotyping is antithetical to affirmative-action- supported education, for it denies the value of individual differences by prejudging and moulding students on the basis of sex. In order for schools to become suitable learning centers for both sexes in which they can explore and develop their human potential fully, sexist practices must be completely eliminated in all levels of schooling.

Otherwise, girls, as Potter (1987: 8) clearly indicated, will withdraw from the competitive classroom arena. The less interaction girls have with their teachers and the less participation they practice in classroom interactions the more these will lead them to develop less skill and confidence.

2.3 Studies Related to Gender Differentiating Science Teaching

During the past fifteen years, research and educational literature have globally paid increased attention to the problem of girls in science and technology. Different studies in this respect have provided insight into various factors that hindered girls'participation and effective performance in the field, and on the way tried to suggest different strategies in making science and technology more attractive and accessible to girls.

The pattern of gender inequality is different and more complex in science and technology. Its major manifestation is the gender typing of the two fields and variations in them. As Useem (1992: 325) pointed out, biology emerges as a feminine subject and physics as a masculine one. Thus, the access of female to the traditionally masculine subject is accompanied by a feminine stereotyping.

Oakes (1990), in his investigation in line with this problem, indicated that the gender gap in taking courses in mathematics and science does not stem from different ability. But the differential ability in different grade levels in mathematics may help boys to be advantaged in physics course taking. The researcher in this case considered

mathematics as a gatekeeper for entry into physics courses. In addition, Useem (1992) similarly stated that the gender gap between boys and girls in physics is the differential ability in mathematics between boys and girls accumulated over time. Useem, studying gender differentiated course taking, analysed 34 American middle schools and found that administrative policies produce variations in course taking.

Towards identifying the quality and quantity of science classroom instruction, Barbara and Cardinal, (1991: 306-310) studied the level of questions asked to boys and girls in fourteen sample school teachers and 307 students. In the result, female students were found conforming to their teachers' expectations, girls response to teacher's questions was low, and they raised their hands less frequently. Girls, due to this, were asked fewer questions than boys. Questions directed to girls were predominantly low level questions, and their interaction was lower than boys. Moreover, girls were given less attention by their teacher than boys.

Handley and Morse (1984), in their study of secondary school science teachers for five consecutive years found that some teachers tend to favour boys more than girls, and girls' interaction in these classrooms was found to be less than boys and the condition increased over time. The study revealed that teachers spend more time reinforcing and rewarding male students than they do female students. Teachers were also observed providing more feedback and prolonged interactions for boys than they do for girls. The investigators concluded that such interactions reflected higher teachers' expectations for boys than for girls.

Sadker and Sadker citing Greenberg (1989: 222) pointed out that:

> Less attention is given to problems in mathematics and science achievement. The result is that the academic problem of girls does not become visible until the later years of their school experience. Although girls' achievement is equal to or higher than that of boys in the early grades, by the time they graduate from high school, they have fallen behind in many areas, particularly in mathematics and science.

Gender differentiation in interest and achievement in science, specially in physics, increased during secondary education. The negative students' attitude towards science

also increased by grade level, and this problem seems particularly severe for females where college-bound girls take less science courses than boys. This trend continues to college, where only a few take physics degrees and more women take biology degrees. A few female students are enrolled in science classes than males, and females report less positive attitudes towards science than males due to the stereotyping to science. (Yager and Yager,1985 and Czeriak and Chiarelott, 1990: 49).

2.4 The Condition of Female Learners in Ethiopian Schools

Article 26 of UNESCO (1979) declares that both sexes should get equal opportunities and the same kind of treatment in education. The article specially stresses the right of females to education at all levels of schooling. But in practice it is the female students who mostly suffer from sex discrimination in education. Females, compared to males, are less represented in all educational ladders regardless of geographical location, ethnic group, and religion.

Out of about fifty million Ethiopians, half are female citizens (CSA, 1993) who are important for the country's all sided development. However, at present, due to different constraints, the number of girls participating in schools is by far less than boys at all levels of schooling (World Bank, 1997; MOE, 1996). But there is a constitutional guarantee that is favourable to female education. The educational policy objective of the MOE (1993/1994: 11), in line with this idea, promises "To gear education towards rewriting society's attitude and value pertaining to the role and contribution of women in development."

Of course, the educational policy spells out the importance of ensuring equality between the sexes in the field of education. However, there is quite a gap between policies on paper and in practice in the schools. The practice in Ethiopian schools is different, though the educational policy does not discriminate between boys and girls.

According to MOE (1996) statistical data on enrolment to education, female enrolment in primary and secondary schools is 22.1 percent and 20.4 percent, whereas

boys' enrolment is 35.7 percent and 31.7 percent respectively. In addition girls' enrolment in higher institutions is also by far less than boys. For instance, in Addis Ababa University Faculty of Science, boys and girls enrolment ratio in biology is 130:15, chemistry 164:29, geology 239:11, physics 135:1, and statistics 158:36.

Accordingly, however, females' enrolment rate compared to male students seems increasing from that of the previous year in primary and secondary levels, girl repeaters in these years are by far higher than the boys in all levels. Girl repeaters in grades 1, 6, 8 and 9 are 10 percent, 14 percent, 15 percent and 24 percent respectively. While the rate for boys in the same grade levels is 8 percent, 4 percent, 10 percent, and 9 percent respectively. Furthermore, the dropout rate of girls in these grades in 1993/94 academic year is 30.07 percent, 8.8 percent, 8.11 percent, and 22.81 percent respectively. But the boys dropout rate is 25.44 percent, 6.55 percent,7.3 percent, and 20.84 percent.

Different studies conducted on Ethiopian Schools by Anbesu and Barbara (1988) Genet (1991) and Assefa (1991) have found out that in addition to the low proportion of female enrolment at different levels of schooling, the academic achievement of boys is significantly better than that of girls in primary and secondary levels. The complexity of the disparity in academic performance between boys and girls is also observed in the ESLCE results. As MOE annual educational abstract (1996) reveals, among the students who got above 2.00 in 1994/95 ESLCE girls constitute only 22.9 percent. Moreover, females who got satisfactory results in science specially in physics are almost none in these years. Numerous attempts have been made to compensate for the marked differences seen between the participation of boys and girls in adopting different entrance criteria for boys and girls to join colleges and departments (affirmative action). The affirmative action designed to encourage girls participation in higher education and science and technology may help to raise girls' enrolment. However, the most important issue that needs serious attention is that girls under achieve at school.

Another study by UNICEF that assessed the stereotyping in schools of Western and Northern Ethiopia has revealed that teachers considered girls as passive and dependent, while the boys were seen as independent and active (Almaz and Barbara, 1990).

Since schools are the only organized and socialized institutions, it seems reasonable to analyse how gender differences are operating in them. Moreover, the teachers' behavioral influence which is the most critical factor in the school practice should be studied in depth.

2.5 Classroom Interaction Analysis

Various systems have been developed since investigating classroom interaction began. Previous works that analysed classroom verbal behaviour failed to give due attention to pupils' verbal behaviour considering it as a function of the teacher's verbal behaviour. Since the 1960s, analysis of classroom interaction through systematic observation has shown remarkable increase and change (Wragg, 1974: 92).

Though there are reports by Bennett and Destorages (1985) and Kyriscou (1992) that, many researchers have been active in the field, a ground-breaking work has been that of Ned Flanders', who developed an effective classroom observation technique for coding teachers' and pupil's verbal classroom behaviour. This system of observation has been found effective and the most widely used in analysing verbal classroom interaction (Delmont, 1985, Dunkin and Biddle 1974, and Chauhan, 1979)

Recent research efforts that analysed classroom interaction that correlated with effective teaching and learning were often structured in recording teachers' and students' behaviour. In line with the advantages of structured system of classroom observation of pupil-teacher interaction like FIAC, Aderson and Burns (1989) stated that: the information gathered using Flanders observation technique in the classroom interaction can be scientific and exact, the structured coding system of Flanders analysis technique dictates the facts recorded and interpreted, the data can be analysed quantitatively and qualitatively with less subjectivity.

2.5.1 Flanders Classroom Interaction Analysis Categories (FIAC)

Classroom interaction analysis is associated with the name of Ned Flanders who designed the systematized classroom observation system originally as a research tool in

investigating teachers' behavioral influence and pupils' attitudes and achievement. Flanders (1970: 34) devised ten categories which he thought would give insight into the nature of classroom interaction.

FIAC system is concerned only with verbal behaviour in the classroom interaction process assuming that the non-verbal behaviour is an adequate sample of the total verbal teachers behaviour. The system does not overlook the fact that other behaviours are not important for the teaching-learning process. But Chauhan (1979) pointed out that the assumption is acceptable due to the fact that a teacher's verbal behaviour is consistent with his/her non-verbal acts. Moreover, Flanders' Interaction Analysis is concerned with recording the verbal behaviour only due to the reliability of observing them than most non-verbal behaviours.

Flanders' classroom analysis system has its own strengths and drawbacks. The system as a research tool has been used to effectively study classroom interaction by various researchers. For instance Perott (1982: 188) in a study of classroom interaction stressed the relevance for it is helping to investigate the balance between initiation and response by teacher and students. Moreover, Anderson and Burns (1989: 2239) pointed out its relevance to study, among others, the influence of teacher behaviour on students' learning. For example, scholars like Measel and Mood (1972), Simon and Boyers / cited in Delmont (1985) have successfully used FIAC to study the impact of teacher behaviour on Students' performance in learning. Scholars have also pointed out some weaknesses of FIAC. For instance, they stated that the system gives less attention to students - verbal behaviour, it gives due consideration to teachers verbal behaviour only, and it fails to specify the kind of response or question (Chauhan, 1979: 157 and Wragg 1973: 99).

Despite these drawbacks, the system is widely used throughout the world to investigate classroom interaction. Flanders attempted to group all verbal classroom behaviour interaction into ten categories classified by three major parts. The ten Flanders categories are presented in the following table with the accompanying explanations for each category.

Flanders' Interaction Analysis Categories (FIAC)

Teacher Talk	Response	1. Accepts feelings:- accepts and clarifies an attitude or feeling tone of pupil in a non threatening manner. Feelings may be positive or negative, predicting and recalling feelings are included. 2. Praises or encourages:- praises or encourages or behaviour that releases tension, but not at the expense of other individuals; nodding head, or saying "um hm or "go on" are included. 3. Accepts or uses ideas suggested by a pupil clarifying, building or developing ideas suggested by pupil. Teacher extension of pupil ideas are included but as the teacher brings more of his own ideas into play, shift to category five. 4. Asks questions:- Asking about content procedure, based on teacher ideas, with the intent that pupil will answer.
	initiation	5. Lecturing:- giving facts or opinions about content or procedure expressing his own ideas, giving his own explanations or citing an authority other than pupil. 6. Giving Directions:- Directions, commands, or orders to which a pupil is expected to comply. 7. Criticizing or justifying authority statements intended to change pupil behaviour from non acceptable to acceptable pattern, bouling someone out stating why the teacher is doing what he is doing, exterem self-reliance.
People talk	Response	8. Pupil talk response:- talk by pupil in response to teacher. Teacher initiates the content or solicites pupil statements or structures the situation. Freedom to express own ideas is limited.
	Initiation	9. Pupil talk initiation:- talk by pupil which they initiate express own ideas, initiating a new topic, freedom to develop opinions and line of taught, like asking thoughtful questions, going beyond the existing structure.
Silence		10. Silence and confusion:- Pauses, short period silence and periods of confusion in which communication cannot be understood by the observer.

Note:* There is no scale implied by these numbers. Each number is classifactory: it designates a particular kind of communication event. To write these numbers down during observation into enumrate not judge a position on a scale

Source: Nel Flanders, (1970, p. 34)

2.6. Studies Related to Interaction Analysis in Ethiopian Schools

Attempts to investigate classroom interaction in Ethiopian schools using systematic observation such as FIAC have been limited. Due to this, it seems hard to show the complete picture of the condition of classroom interaction in Ethiopian Schools in different levels and subject areas. Specially the investigation of gender differentiating teacher behaviour have been non-existent until recent years.

However, the significance of teaching behaviour for the performance and progress of students' learning and its implications on the learner have been demonstrated by Abdul Kadir (1984), Mccoul (1994), Abdulaziz (1977), and Tassew (1992) in English, Mathematics, Geography and Science respectively.

All the four studies found that teachers did most of the talk and pupil talk is minimum. Most of the teachers were found to be direct in their teaching influence and most of the teachers emphasised on content areas or subject matter than motivating the students. In all these investigations, extended period of silence and confusion were observed. In addition, Mccoul (1994) found that boys were dominant in all the classroom interactions than girls, specially in initiating teachers. Tassew (1992) also found the periods to be limited to the question-response pattern and female teacher trainee students were direct in their influence than males. In this study, high intelligence group of T.T.I. students teacher trainees were indirect in their influence and their pupils interacted better than the group with low intelligence.

Overall, the review indicates a need for exploring gender differentiation reflected in senior secondary school teachers teaching behaviour and its implications on the academic status of female students. This could be a help in female education development and involvement in science fields in the region under study as well as in the country at large.

CHAPTER THREE

THE RESEARCH DESIGN AND METHODOLOGY

As indicated in chapter one, the study was aimed at investigating gender differentiating secondary school physics teachers verbal teaching behaviour during classroom interaction that could affect female students interaction during physics instructional process in the Amhara Region. Since the study was believed to be the first of its kind carried out in our schools, a descriptive survey research approach was employed with the assumption that it would give a clear picture of the current female learner's situation.

3.1 Population and Sampling Procedures

Originally, there were seven zones in the Amhara Region. These were later organized in adding four special zones. Currently there are seventy - seven secondary schools in these zones.

Due to shortage of time, fourteen secondary schools namely Dembecha, W/o Sehen, Teklehimanot, Kombolcha, Fassiledesse, Tanahaik, Hotie, Motta, Dangla, Woretta,Woldia, Debre-Marcos, Dagmawi Tewodros, and Hailemariem Mamao were selected based on the following criteria using the Region Educational Bureau annual abstract.

- Secondary schools in which high female repetition rate is observed.
- Schools having considerable number of girls in grade 9.
- The presence of female physics teacher in the school.

Hence, the population of this study covered fourteen randomly selected physics male teachers due to lack of female physics teachers during the data collecting process as was indicated in the Educational Bureau statistics, and one thousand eighty students of grade 9 (564 male and 516 female). The 9th grade section was selected among the other 9th grade sections due to having balanced number of boys and girls in the class.

3.2 Date Collection Instruments

The purpose of this research was to investigate teachers' behaviour with regard to gender differentiating teaching on the basis of Flanders' Interaction Analysis technique. In order to obtain valid and reliable information for the study, Flanders' systematic observation technique was employed as a data gathering instrument.

In the data gathering process, a video recording and tape recording (for schools with out electric power) were used to make an intensive investigation of the classroom verbal teaching behaviour which were difficult to code effectively in live classroom observations. The advantages of the video sound recordings lie on the fact that the behaviours and their sequences can be played back or heared back over and over again in order to pick-up the preferred behaviours for the investigation thereby promoting objective investigation of these behaviours. Moreover, using a video sound and an audiotape recorder reduceed the cost for the transportation and perdiem of observers during the data collection process in the different zons of the region.

Before the actual data gathering commenced, the following steps were undertaken. In the first phase an observation schedule (observation check-list) was set which reflected the objective and intent of the study. Based on Flanders (1970) and the ninth grade physics text-book a training manual consisting of three parts was designed to train the observers (see Appendex A).

In the second phase in order to make the systematic observation effective three observers who were knowledgable about teaching methodology were trained with the skill of observing teachers' behaviour using Flanders' Interaction Analysis Technique of observation using live and recorded classroom interactions. Many practice sessions were provided until inter-observer reliability value of Scott's Coefficient was higher than 0.85 for male and female students in the three continuous observations. Interobserver agreement was computed using Scott's reliability Coefficient formula as suggested by Flanders (1970). Each observer seems consistent and there seems to be agreement between observers in coding the behaviours. The correlation Coefficient between the observers seems highly correlated and found to be significantly high. The highest was observed to be (0.98 for females and 0.89 for males) (See Appendix B for details of

Finally the individual master matrices for each of the fourteen sample teachers were again combined to one master - master matrix for the whole group (sample of physics teachers as a group) which is the major concern of the analysis. From the master-master matrix percentage was computed in accordance to each category in the analysis process. From the master-master matrix different ratios which could have clear relationship with gender differentiating teaching like teachers praise or encouragement ratio, questioning ratio, initiation and response ratios towards boys and girls and pupil response and initiation ratios were computed for boys and girls separately based on Flanders (1970) formulae. Since the basic objective of the study was to analyse secondary school physics teachers gender differentiating teaching behaviour as a group individual matrices were not taken up in the detailed analysis of the study.

Depending on the nature of the basic questions of the study and the data collected, different statistical methods were employed. To calculate the different ratios and The frequency of each category, percentage system of data analysis was employed throughout the study. To see or determine the probability that the difference between the mean between girls and boys was a real difference rather than a chance difference t-test was employed. Chi-square (X^2) statistical method was also computed to see whether the difference between boys and girls was significant in each ratio of behavior targeted in the study. Most of the Flanders categories have given expected values and a formula is given for finding out the expected values for the other categories. Due to this chi-square statistical test was suitable to test the significance of the differences of the ratios.

CHAPTER FOUR

PRESENTATION AND INTERPRETATION OF DATA

This part of the paper deals with data analysis, interpretation and explanation of results. The discussion relates only to male teachers due to lack of female physics teachers in the region at the time of data collection.

The raw data obtained through systematic observation for boys and girls separately during physics classroom interaction were organized, analysed, interpreted, and explained. Most of the data were organized using tables and a 10 x 10 matrix followed by relevant explanations. Since the only possible way of investigating the general condition of the extent and features was through the use of the gender differentiating teaching behaviour analysing all sample physics teachers as a group, individual matrics were not taken up separately in the detailed analysis. But first, let me present the bio-data of the sample teachers.

4.1 Bio-Data of the Physics Teachers

TABLE I

Bio-Data of the Sample Teachers

No.	Sex	Total Years of Experience	%	No.	Sex	Qualifications	%
3	M	0-10 years	21.43	8	M	Degrees	57.14
7	M	11-20 years	50.00	6	M	Diploma	42.86
4	M	Above 20years	28.57	-	-	-	-
14		Total	100	14			100

The above table shows that all teachers involved in the study have had teaching experiences ranging from one to more than 20 years. Among them three teachers have served from 1-10 years, seven between 11-20 years and the other four for more than twenty years. Eight of the teachers, as table I indicates, have BSc. degree while the other six have diploma in physics.

In the study, it was primarily intended to investigate whether any relationship existed in classroom interaction of female and male teachers with their male and female students. But it was not possible to verify the hypothesis due to lack of female physics teachers in the region during the data collection time. It is safe to say that had female students been studying physics some of them would have become teachers. This condition could therefore be taken as one evidence of female low involvement in physics subject compared to male students.

4.1 A Study of Gender Differentiated teaching Behaviour of Physics Teachers

As indicated above, in order to highlight certain aspects of the gender differentiating teaching behaviour of teachers as a group, behaviours like accepting pupils' feelings, praise or encouragement, using pupils' ideas, teacher questioning, giving directions and criticism, teachers' response, pupil-talk response and pupil-talk initiation were investigated using the master-master-matrix obtained by combining the fourteen individual metrices of the sample teachers. This was done purposefully by the investigator's decision to include the general descriptions of the extent and features of the gender differentiating verbal teaching behaviour in classroom interaction comparing boys and girls. Teaching behaviour ratios that can have direct relationship with the gender differentiated verbal teaching behaviour were also included in the analysis in order to clearly show the gender biased teaching behaviour during the physics classroom interaction.

4.1.1 Comparison of Verbal Teaching Behaviour on the Basis of Master-Master-Matrix

TABLE II

Master-Master Matrix Showing All Physics Teachers Behaviour Towards Boys and Girls

Categories		1	2	3	4	5	6	7	8	9	10	Total	%
1	F	2	-	1	3	11	-	-	6	2	7	32	0.11
	M	29	11	6	10	21	-	-	13	11	3	134	043
2	F	3	20	17	15	12	3	-	30	3	60	173	0.61
	M	19	57	35	37	57	5	-	81	13	23	327	1.02
3	F	2	4	56	52	119	2	-	15	9	37	296	1.02
	M	3	23	143	84	173	12	1	64	40	50	593	1.90
4	F	-	10	-	182	43	6	1	420	8	156	831	2.86
	M	-	13	2	330	83	13	8	651	20	202	1322	4.23
5	F	3	10	2	269	21649	18	7	81	10	415	22464	77.39
	M	14	13	3	406	21649	51	15	160	40	351	22703	72.56
6	F	-	2	4	10	34	60	7	9	3	53	182	0.63
	M	2	3	2	28	69	126	12	30	12	54	338	1.08
7	F	1	1	-	5	12	2	15	3	-	11	50	0.17
	M	7	-	-	13	13	3	49	21	9	17	132	0.42

F M	13 17	38 108	111 254	155 265	167 243	16 39	10 12	182 285	8 43	207 192	907 1458	3.13 4.67
F M	3 4	4 24	19 53	6 22	5 28	6 29	1 14	5 8	31 77	38 55	118 314	0.41 2.00
F M	5 39	84 75	86 95	129 127	462 367	69 60	9 21	156 145	44 49	2989 2989	3973 3967	13.68 12.67
F M	32 134	173 327	296 593	831 1322	22464 22703	182 338	50 132	907 1458	118 314	3973 3967	29026 32288	100 -
F m	0.11 0.43	0.61 1.05	1.02 1.90	2.86 4.23	77.39 72.56	0.63 1.03	0.17 0.42	5.13 9.47	0.41 1.54	13.68 12.67	100 100	

*See Appendix C for Individual Matrices
Ratios calculated using Flanders Formula Based on Table II

Females

TT = 82.78
PT = 3.53
SC = 13.68
ITT = 4.57
DTT = 78.19
i/d = 2.15
TRR = 68.54
TQR = 0.60
PIR = 11.51

Male

TT = 81.66
PT = 5.66
SC = 12.67
ITT = 7.59
DTT = 74.06
i/d = 2.24
TRR = 69.16
TQR = 5.50
PIR = 17.52

4.1.1.1 Accepting of Students' Feelings (Category 1)

A close observation of table II indicates that teachers' statements expressed in accepting and clarifying attitude or feelings of pupil was observed low for both sexes. Flanders (1970: 40) has shown that these patterns of teaching behaviour are relatively rare and infrequent because most of the time students and teachers suppress their positive or negative emotional reactions in classroom interactions.

When the data is observed on the basis of students' sex, the time devoted to teachers' accepting of feelings was found to be 0.43% for male students while the females got only 0.11%. The situation indicated that teachers accepting of feelings generally in physics instruction is low in these schools. Nevertheless, male students' feelings were found to be better accepted by their teachers than the females'. In the view of psychologists like Watson (1979) when teachers do not accept students' feelings during classroom interaction,the unaccepted group may retreat from expressing their feelings and on top of this the students may escape from the classroom competitive arena as a whole.

To substantiate the above results on teachers' accepting of students' feelings, a test of significance was computed using a t-test. The results indicated that teachers' variations in accepting feelings of boys and girls in classroom interaction was statistically significant. This is said because the calculated t-value ($t = 7.48$) is greater than the critical t-value ($t = 1.96$) (See appendix D for details of calculations).

Hence, a possible explanation that could be provided for the result is that the low level of teachers' praise and encouragement, and less use of girls' ideas in classroom discussions may lead the female students to suppress their negative or positive feelings and withdraw from participating in classroom interactions with their teachers. That could in turn decrease their classroom interactions which may lead possibly to less teachers' accepting of feelings of girls. Previous research results by Dweck cited in Renzetti and Curran (1989) confirmed the above result, by showing that most of the time girls who forward their feelings were not accepted or rewarded by their teachers.

4.1.1.2 Praising or Encouraging Pupil (Category 2)

Teachers' statements of praise or encouragment for pupils' contribution were observed low for both male and female students as can be observed from table II. However, a closer look into the data also shows that the percentage of teachers' praise or encouragement for male students was greater than their for females' at 1.02%. The time devoted for females for the same verbal teaching behaviour was only 0.61%. The result reflected that the physics teachers used more praise and encouragement to male students than to females. The low frequency of praise for females in these classes indicates that girls were encouraged and praised by their teachers less frequently than boys. This is evidenced by the computed t-value, 8.95 which was greater than the critical t-value (t_5 = 1.96) at 0.05 significant level. This means, the significant test confirmed that there was significant difference in teachers' praise and encouragement between boys and girls in classroom interaction.

The findings of the present study was in line with UNESCO's (1984) results which invariably reported that most of the teachers praised and encouraged boys than girls during classroom interactions. In this connection, Fontana (1995) and Renzetti and Curran (1988) studies on teacher praise and encouragement have indicated that the less praised students are deprived of the vital advantages of teachers' praise that are highly rewarding for students in establishing warm and productive interactions with their teachers, thereby developing positive attitudes to learning and its stimulating role for their further development in learning.

In the final analysis, what this finding has revealed is that decreased teachers' praise of female students could be the result of less female students' interactions and participation in answering teachers' questions during physics instruction. That in turn could be the effect of low teachers' initiation and questioning towards female students.

4.1.1.3 Accepting or Using Pupil Ideas (Category 3)

As indicated in table II teachers' acceptance of students' ideas and using their acknowledge, clarifying the meanings, applying their ideas or asking questions on the basis of pupil ideas was low in general in these physics classes. But when seen in

comparison to students' sex, the teachers' verbal behaviour was observed to be imbalanced. The combined matrix in table II shows the occurance of the highest percent of frequencies for male students (1.90%) in these classroom interactions. On the other hand, the percentage of the same teachers' behaviour was observed slightly less in the case of female students (1.02%).

Thus, it was evident, to verify that the physics teachers seemed to give less emphasis for accepting or using pupil ideas. Moreover, the extent to which teachers acceptance or use of female students' ideas in the classroom discussion was less than their male peers. This was confirmed by the calculated t-value which showed high statistical significance of the teachers' difference in accepting and using girls' and boys' ideas. The observed t-value (t=8.05) was greater than the critical t-value (t = 1.96) at 0.05 level of significance.

This condition implies that female students' ideas in these physics classroom interactions were accepted and used by their teachers less frequently than their male countrerparts. This may result from female students' less participation in classroom interaction which in turn may be the result of the influence of the physics teachers' less response, low acceptance of feelings, using their ideas, and decreased encouragement to female students.

4.1.1.4 Teachers' Questioning (Category 4)

Teachers' questioning to draw out pupils' response improves their quality and quantity of participation in the classroom interactions and this normally covers one-six to one-tenth of the whole instructional period (Dunkin and Biddle, 1974). The time devoted to questioning in the observed periods in this study, as table II reveals was less than the normative expectation. The portion of time teachers used for questioning was 4.23% for male students while for females it was surprisingly low (2.86% only).

The data show that physics teachers asked female students unexpectedly less number of questions than they asked male students during their classroom interactions. On the other hand, male students, due to the more number of questions devoted to them among other things, spend most of their time in learning related activities and interact

more with their teachers than do the females. In this way, the girls were less motivated and stimulated to be engaged in different kinds of thinking because of low teachers' questioning. This finding is in conformity with the results of the study by Barbara and Cardinal (1991) which identified the quality and quantity of questioning in science instruction and discovered that girls were asked less number of questions than boys, and questions directed to girls were dominantly low level questions.

The final result achieved in this study indicates that the teachers' questioning difference was statistically significant in relation to students' sex, because the calculated t-value (t_5=9.05) was higher than the critical t-value (t_5 = 1.96) at .05 significant level. This may be the effect of teachers' questioning technique in that they may ask only volunteers who raise their hands. Due to this, female students may not get chances to answer questions since their classroom interactions is low. Though the teachers should be careful in asking questions by giving chances to non-volunteers by providing cues to answers to motivate students' participation than asking only volunteers. Moreover, the teachers also should try to build a classroom atmosphere in which all students are encouraged to answer questions and participate freely in classroom interactions (Callahan and Clark, 1988: 182).

4.1.1.5 Teachers Giving Directions (Category 6)

The standard time used by teachers for giving directions of any kind occupies six percent of the instructional time according to Dunkin and Biddle (1974). However, the time teachers take for giving directions in this study was found to be low. Teachers' giving directions to boys was (1.08%). When this was compared to that of girls, it is high since teachers giving directions to girls was only 0.63%.

Although the observed physics teachers using directions in these classes was low, a wide variation was observed in teachers giving directions to boys and girls in these classroom instructions. Boys were observed to get the highest number of directions than do girls during these interactions. The study reveals that girls and boys were not given similar number of directions by their teachers. The previous research findings of Dewek cited in Renzetti and Curran (1989) was of similar nature by that, reported girls and boys were provided different directions and classroom chores by their teachers; teachers

provided boys more detailed step by step directions more than what the girls get; and girls were asked to water plants while the boys were manuplating equipment and testing chemical during science classroom interactions. In this way girls were deprived of independent learning which could have resulted from self directed experiences in these physics classes.

In addition, the statistical t-test result indicates that the teachers difference in giving directions to boys and girls was significant. This was shown by the calculated t-value, 5.96 which was higher than the critical t-value 1.96 at a .05 level of significance.

4.1.1.6 Teachers Criticizing and Justifying Authority (Category 7)

According to Flanders, teachers' criticism of pupils' non-acceptable behaviour to change it to the acceptable pattern of behaviour accounts less than ten percent of the total teaching time. A closer look at table II shows that 0.42% of the instructional time was spent in criticizing boys where the girls were criticized only 0.17%. The result indicates that teachers used criticism less frequently in these physics classes. However, the data reveal a wide difference in teachers' criticism of girls and boys. Though the physics teachers' criticism was high to male students than to the females it shows an opposite tendency of teachers difference observed in the other verbal teaching behaviors (girls were criticised less than the boys). Similar results were found in previous research by Sadkar and Sadkar as cited in Renzetti and Curran (1989: 78). They indicated more teachers' challenge and criticism to boys than to girls in academic related matters. But as this finding reflects these teachers high challenges to boys was in making them try and find a possible means of improving their academic achievements more than the girls.

Furthermore, from the psychological viewpoint the criticized student may develop strategy to avoid criticism and it may not be bad for the student's long term personality development. Criticism, moreover, induces an internal state of drive that has an energizing effect in the deprived student and could result in a positive effect by creating vigour in him/her to withstand the criticism. This is so because for some students negative teachers' statements may stimulate positive attitude to learning than the negative. This in other words means the girls who were less criticized might have lost the strategy of developing strength to withstand criticisms and problems. On top of this, the

girls also may not gain the positive stimulating effect of teachers' criticism to learning (Watson, 1979:42). This view is confirmed by Flanders (1970) who showed in his studies that high teachers' criticisms are indicatives of close supervision and direction and a true teacher initiation reflections towards classroom interactions.

The t-test value computed based on teachers' variations in criticizing boys and girls in classroom was found to be significant at .05 level showing t-value, 5.61 which was higher than the critical t-value 1.96. The findings of the study could, however, be explained by the following reasons: since the female students have low classroom interactions with their teachers the condition might have helped to lower teachers' criticism forwarded to them. On the otherhand, the male students who, due to high teachers' praise, have increased classroom interactions might be criticized more.

4.1.1.7 Pupil-Talk-Response (Category 8)

The frequency of occurance of pupil-talk response in the physics classes was found to be fairly large when compared to the other categories of teaching behaviour. The amount of time devoted to pupil-talk-response for male students was 4.47% while for females it was only 3.13%.

It is clear that in these physics classes boys were interacting more with their teachers than females and this shows that the classroom interaction was monopolised by limited number of habitual participants who were mostly males. The t-value 9.72 computed also indicates the significance of pupil-talk response difference between boys and girls, because the observed t-value 9.72 was higher than the critical t-value 1.96 at .05 significant level.

This finding goes against Clark's (1995) suggestion which stressed that the teacher should use different techniques like questioning to provide interaction opportunities equally to his/her students. This is because classes dominated by only few students are hardly satisfactory and the teacher should motivate the non-volunteers to be involved in classroom interactions.

The less number of female response may be the influence of less teacher questioning, praise, and response to female students. On the otherhand, the teacher questioning strategy of calling on only volunteers may affect girls' response since female students interaction was observed low in these classroom interactions.

4.1.1.8 Pupil-Talk-Inititiation (Category 9)

The portion of time devoted to pupil talk initiation in classroom interaction was less than ten percent as found out by Dunkin and Biddle (1974). As clearly shown in table II, less time was devoted to the initiation category generally. The computed pupil-talk initiation accounted for only 2.00% of the instructional time for boys and 0.41% for girls. From this total time provided to pupil-talk-initiation, the male students' used the highest time compared to females. In this way female students self-initiated talk with their teachers was lower than their male counterparts. The t-test computed on the difference between boys and girls for pupil-talk-initiation showed a strong statistical significance as its t-value 8.58 was much higher than the critical t-value 1.96 at .05 level of significance. Dewck's findings as cited in Renzetti and Curran (1989) also showed that girls had fewer self-initiated talk in classroom interactions.

This situation might have resulted from teachers' less praise and encouragement to female students in classroom interaction. The less amount of questions directed to female students by their teachers (as indicated in table II Category 4) have a great influence on female self-initiated talk and their response. In confirming this idea Barbara and Cardinal (1991) in their studies have shown that girls were given less attention by their teachers than boys and due to this they have decreased classroom interactions than their male peers.

In summary, in relation to the general situation of the physics teachers teaching behaviour in these classroom interactions, the majority of the instructional time was dominated by the involvement of the male students. Teachers interacted highly with male students than with female students and generally female got less praise, number of questions, response, and low directions from their teachers. This condition indicates a difference in teachers' teaching behaviours when applying Flanders selected categories with boys and girls. The result suggests that improving teachers' teaching behaviour in

physics classroom interactions could have an impact on female students low classroom interaction during physics instruction.

4.2 A Study of Physics Teachers Teaching Behaviour Based on Different Behaviour Ratios

Flanders suggested different arithmetical procedures or formulae that are commonly used in order to make comparison between two or more matrices ratios. From these, the most convenient method, and one which is widely used, is to convert all column total to percent and then calculate ratios for which we have normative expectations. The following ratios were computed based on these procedures.

TABLE III

4.2.1 COMPARISON OF "TEACHER-TALK', "PUPIL-TALK",

Ratios	Gender		Norm	Chi-Square (X^2)
	Male	Female		
Teacher-Talk (TT)	81.66	82.78	68	5.95*
Pupil- Talk (PT)	5.66	3.53	20	27.12*
**Silence and Confusion(SC)	12.67	13.68	12	0.27
Total	100	100	100	

* Significant at $P < .05$ level (For Detailed Calculation See Appendix E).

** (SC) was only Presented for the sake of showing the rest of the time was devoted to the category.

4.2.1.1 "Teacher-Talk" and "Pupil-Talk"

Flanders shows that one way of classroom interaction is monopolizing the instructional time by teacher-talk. To investigate how much teacher-talk have been used

calculate "Teacher-talk" adding all the column totals (one to seven) dividing the sum by the total frequency of the matrix and multiplying it by hundred ($TT = \frac{1 + 2 + 3 + 4 + 5 + 6 + 7}{N} \times 100$)

"Pupil-talk" ratio also could be calculated by adding all pupil talk categories, dividing by the matrix total frequencies and multiplying it by hundred ($PT = \frac{8 + 9}{N} \times 100$).

By dividing total frequencies of category ten and dividing by the total matrix frequency and multiplying by hundred gives "silence and confusion" ($SC = \frac{10}{N} \times 100$).

As indicated in table III in comparing "Teacher-talk" and "pupil-talk" based on students' sex, the only interpretation that might be made was that there seems to be similarity in being far from the norm, but otherwise they are remarkably alike. The ratio of "Teacher - talk" and "pupil-talk" was 81.66 and 5.66% for males whereas for female students it was 82.78% and 3.53% respectively.

The elapsed time for both teachers' behaviours during classroom interactions when compared to students sex as can be observed in table III, indicates that "teacher-talk" ratio was high for female students while "pupil-talk" was surprisingly low for them. The same variable (teacher-talk) was observed to be low for them while and pupil-talk was high for male students. The low "ratio of teacher talk and high pupil-talk "for male students was vice versa for females and clearly reflects high male-talk and less female-talk in classroom interactions. From this, one can understand that male students are less dominated by teacher talk than females.

The condition implies that the physics teachers gave less time to interact with the female students than the males. Female students were also observed to be far from normative expectations in both cases than their male peers. This clearly indicates that teachers did not give equal interaction opportunities for male and female students in their physics instruction. The chi-square computed based on table III showed statistical significance of teacher-talk and pupil talk differences between boys and girls in classroom interaction, the calculated X^2 was 5.95 for teacher-talk and $X^2 = 27.08$ for pupil-talk, higher than the critical value $X^2 = 3.84$ in $P < .05$ level. The results, thus, suggest that female students were less interactive in these classes than the males due to wide teacher talk and less praise and initiation to them.

TABLE IV

4.2.2 COMPARISON OF "TEACHER QUESTIONING" RATIO AND OTHER VARIABLE RATIOS

Ratios	Gender		Norm	Chi-Square (X^2)
	Male	Female		
Teacher Questioning Ratio (TQR)	5.50	3.56	26	35.53*
Teachers Response Ratio (TRR)	69.16	6834	42	34.02*
Pupil Initiation Ratio (PIR)	17.72	11.51	34	22.67*

* Significant at $P < .05$ (See Appendix E for Details of Calculation)

4.2.2.1 Teacher Questioning Ratio (TQR)

The ratio, as Flanders shows, represents the teacher's tendency to use questions when guiding the classroom content oriented instruction in classroom instructions. The ratio is calculated by dividing the sum of category four by the total matrix frequency and dividing it by hundred ($TQR = \frac{4}{4+5} \times 100$).

The normative expectation for teacher's questioning ratio is 26%. But the observed ratio of questions for physics teachers based on students sex was 5.50% for females and 5.56% for male students as table IV reveales. The ratio in general was unexpectedly lower than the norm for both sexes. On the other hand, questioning ratio for female students was exceptionally below the norm and less than that for males. The situation reflectes a wide gap in teachers' questioning between boys and girls.

The findings imply that the physics teachers were not forwarding questions in similar numbers to male and female students in these physics classes. The male students were observed getting more number of questions from their teachers than the female

students. In this way, girls seem less initiated and motivated than males by their teachers' questions. The male students on the other hand, due to getting more questions from their teachers, seem interacting better than the female students with the teachers during the physics classroom interactions.

To test the significance of the teachers' questioning variations to boys and girls a chi-square was computed. The chi-square statistics ($X^2_5 = 35.53$) at the $P < .05$ showed a high level of significance because the observed ($X^2 = 35.53$) was greater than the critical chi-square $x^2 = 3.84$. The condition may result from teachers' low response and less praise and encouragement to female students.

4.2.2.2 Teacher's Response Ratio (TRR)

Teacher's response ratio, as Flanders shows, can be calculated by adding the total frequency of category one, two, and three, and dividing the result by the total frequency of the same categories plus the total frequency of the categories six and seven and multiplying the result by hundred

$$(TRR = \frac{1 + 2 + 3}{1 + 2 + 3 + 6 + 7} \times 100).$$

Based on Flanders study the results indicate that the normative expectation of TRR is 42%. But as table IV reveales the ratio for both sexes was exteremly higher than the norm (69.16% for boys and 68.34% for girls). The result seem controversial when we refer back to the master-master matrix (table II) which was the basis for all computed ratios. The teachers' response categories (1, 2, and 3) occupied negligible amount of time and frequencies for both boys and girls.

The difference between the teacher response category frequencies and the "teacher-response" ratio leads one to investigate the condition in depth. The situation needed a thorough observation of the formula denominators that were different from the response categories (category 6 and 7). These category frequencies were by far lower than Flanders normative expectations (see table II). In other words, these low numbers of teachers directions and criticism were influenced by the longer time devoted to

lecturing in these periods. These insignificant frequencies of category 6 and 7 in turn influenced the TRR to be unexpectedly higher than the norm for both groups. This can be verified by using the observations of category 6 and 7 in substituting in the formula to find out the TRR.

The exact teachers' response could be clearly observed on the master-master matrix for both sexes. The teacher response categories (1, 2 and 3 of table II) covered only 0.43%, 1.05%, and 1.90% for males and the same categories covered 0.11%, 0.61%) and 1.02% for females respectively. This reflects that teachers response shows an imbalance between the two sexes.

The result implies that teachers' response to boys and girls was not similar in these classes. In addition, teachers were observed to be more responsive to boys than to girls. The chi-square computed in investigating the significance of this teacher response difference between boys and girls showed that (X^2=34.02, $P < .05$). This means the teachers' response variation was statistically significant since the computed X^2- value, 34.02 was higher than the critical value of it ($X^2 = 3.84$).

The condition could be explained by saying that the result was due to teachers' decreased attention to girls' feelings and using their ideas less as can be observed in category 1 and 2 (table II). Moreover less teachers' praise and encouragement was a major factor in influencing the less teachers' response ratio to girls.

4.2.2.3 Pupil Initiation Ratio (PIR)

Flanders indicates that pupil initiation ratio is the proportion of pupil-talk as the act of their initiation towards their teachers. The PIR can be calculated by dividing the total frequency of category nine by the sum of all pupil-talk categories and multiplying by hundred ($PIR = \frac{9}{8+9} \times 100$)

The situation of pupil initiation ratio as can be observed in table IV is below the norm of Flanders studies (34%) for both sexes. As could be observed, male students showed better initiation in introducing their ideas to the classroom discussion. This is

indicated in the pupil initiation ratio which showed 17.72% for them. On the other hand, the PIR for female students was less than the males at 11.51% and this indicates that girls were less initiating in classroom interactions.

From the results one can understand that pupil initiation in general for both sexes was lower than the norm in these classroom interactions. However, the male students were observed to be better initiating in these physics interactions than the females. The situation implies that there is less female interaction with teachers than male students. The chi-square computed also confirmed the significance of the variations between male and female students initiation towards their teachers in physics classroom interactions. The chi-square statistics ($X^2 = 22.67$ $P < .05$) indicates that the observed value of $X^2 = 22.67$ was greater than the critical value of (3.84).

Finally, as the findings reveal, female students were found less initiating than males. This could be due to teachers' low questioning, praise and encouragement in these physics classroom instructions.

4.2.3 Teacher's Indirect / Direct Ratio (i/d)

TABLE V

INDIRECT/DIRECT TEACHERS' INFLUENCE RATIO TOWARDS BOYS AND GIRLS

Ratios	Gender	
	Male	Female
Direct Teacher-Talk (DTT)	74.06	78.19
Indirect Teacher-Talk (ITT)	7.05	4.57
Indirect / Direct Ratio (I/D)	2.24	2.15

4.2.3.1 Teacher's Indirect/Direct Ratio

Flanders classified verbal teaching behaviour into indirect and direct teacher's talk. The direct teachers-talk is expressed in category five, six, and seven. The indirect teacher's talk is reflected in categories one, two, there, and four. The balance between the indirect and direct teaching influence clearly shows the notion of freedom of interaction, as Flanders incicated. The indirect/direct (i/d) teacher's behavioral influence could be calculated by dividing the teachers response category frequency totals, and dividing by category six and seven. $(i/d = \frac{1 + 2 + 3}{6 + 7})$.

Table V shows the indirect/direct teachers teaching influence (i/d) ratio computed based on the master-master matrix towards male and female students. As the ratio indicates, most of the physics teachers were observed to be direct in their teaching influence for boys and girls. The teachers' direct influence for males was 74.06% and 78.19% for female students where the indirect influence for male students was 7.59% and 4.57% for females. From the result, it could be concluded that male students were more influenced by the indirect teaching influence than the direct whereas female students were not.

The result generally reflectes that physics teachers were mostly direct in their teaching influence towards girls than they were to boys. On the other side, boys were less influenced by direct teachers' approach than girls. This could result due to the low teachers' response, criticism, and directions directed to girls since direct and indirect teaching influence are related to teacher-talk as can be observed in categories one, two, three, six and seven (table II). This finding is in harmony with Flanders' (1970) research results and reviews which indicated that teachers were more direct in their teaching influence.

CHAPTER FIVE

5. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary

The major concern of this study was to explore the gender differentiating verbal teaching behaviour of secondary school teachers as reflected during classroom interaction and its implications to the academic status of female students in selected schools of region three, specially in 9th grade physics instruction.

In order to achieve the purpose of the study, basic questions were designed in line with the application of Flanders' selected categories, namely: teachers accepting students feelings, teachers accepting and using pupil ideas, praising or encouraging, questioning, giving directions, and criticising and justifying authority directed towards boys and girls, pupil-talk-response and pupil-talk-initiation. Moreover, questions regarding the relationship between the classroom interaction of the verbal teaching behaviour of male and female teachers towards male and female students were raised. However, due to absence of female physics teachers at the time of classroom observation in the region, questions related to female teachers could not be answered.

Taking the basic questions into account, the study was conducted using slightly modified Flanders Interaction Analysis categories and observation techniques as a data gathering tool (so that classroom observation notes can be taken separately during students', interactions with their teachers for the sake of comparison).

The data obtained using FIAT were analysed using different statistical tools, percentage, and different teaching behaviour proportion ratios assumed to be sensitive to the gender differentiated teaching based on Flanders Formula. A t-test was employed to see the statistical significance of teaching behaviour and devaition of time differences towards boys and girls in physics classroom interaction. Moreover, chi-square was also computed to test the level of significance of the variation of teaching behaviour proportions of ratios between boys and girls by their teachers. The result of the findings can be summarized as follows:

1. Application of the selected Flanders' Categories in classroom interactions by physics teachers with boys and girls was found imbalanced. The instructional time which was mostly dominated by teacher-talk was used for interactions of male students and the teachers. In other words, the less time was used to interact with female students, only 3.53% while for males 5.66%.
2. The physics teachers response in accepting students feelings (category 1) generally was observed low in these physics classes for both sexes. However, teachers showed a remarkable preference in accepting male students' feelings compared to their female students and teachers' variations in their responsed to girls and boys was found significant. They responded 80.72% in accepting male student feelings.
3. Praise and encouragement were used less for boys and girls as a whole. However, the physics teachers were found to praise female students less frequently than their male peers' Girls got only 34.6% of teachers encouragement in these periods.
4. The teachers teaching behaviour difference between using the ideas of male and female students was found significant. Male students' ideas were highly used by their teachers in classroom discussions, than female. Male students', ideas were used by the teachers in 66.70% of the cases in these physics instructions.
5. The physics teachers tendencies towards using questioning in guiding the content oriented classroom interactions was unexpectedly found to be low for boys and girls in these physics classes. But, using questions to motivate and encourage the students was observed to have decreased more for female students than males. In these classes, girls only got 41.64% of the teachers' questions.
6. In the physics classroom interactions, teachers' giving directions were found to be generally low. However, teachers provided more directions to boys than to the girls. Teachers' directions in these classes was directed in 65% of the cases to boys.
7. For both sexes, teachers' criticism and justification of authority was low in these physics classes. Nevertheless, teachers criticism towards boys was found high compared to their female counter parts, in these classes 72.53% of the criticism was forwarded for boys.
8. The physics classroom interactions were dominated by male students. Teachers interact and respond to female students less frequently compared to males.

Teachers response in these classes to girls was only 32.14% during physics instruction.

9. Teachers initiation towards boys and girls using different techniques for both groups was low. Teachers were observed to be relatively highly initiating the boys using praise or encouragement and questioning than they do the girls. Girls were influenced by teachers 4.57% indirect and 78.19% direct teaching behaviors where males were 7.05% indirect and 74.06 directly influenced.
10. In these physics classes teachers were observed to be direct in their teaching and used less indirect teaching influence. Nevertheless, the direct teaching influence was found more used with girls than with the boys, and in the case of the direct influence the opposite was true.

5.2 Conclusions

Based on the analysis of the findings, it can be concluded that Region Three's secondary school teachers are gender-biased in their physics instruction during classroom interactions. Variations of teachers' praise or encouragement, accepting students feelings and teachers' response towards pupils' feeling, initiation, giving directions, and criticism towards boys and girls were found significant during the physics classroom interactions. The magnitude of teachers' interaction was high with male students compared to females. Teacher-talk was highly dominating on both sexes, but it was severe for girls. Moreover, the classroom interaction was dominantly used or occupied by male students and teachers in exchanging their ideas. From all these, it still seems true that the cummulative average impact of gender-biased teaching behaviour was found to be significantly more influencing and severe for girls than their male counterparts.

5.3 Recommendations

Considering the problem involved in secondary schools of the Region with regard to the gender-biased verbal teaching behaviour in physics classroom interactions, the following recommendations are made based on the findings of this study:

1. Although from the investigation it seemed that boys and girls were mostly dominated by teacher-talk because of the prolonged lecture used in these physics

instructions, there were very much restricted pupil-talk interactions. The girls were likely to be left out of the opportunities of the classroom interactions than the boys. This significant difference is a problem for girls learning since the existence learning of is often measured in terms of increased pupil participation and interactions in the instructional process. To improve this condition, teachers during their training should get valuable pedagogical and psychological courses that could help them develop skills in encouraging high participation of students during classroom interactions. This again entails needs a thorough evaluation and revision of the pedagogical and psychological courses offered at the present time in secondary school teacher training institutions.

2. Flanders' Interaction categories in general were not applied equally to girls and boys during physics classroom interaction. This shortcoming has a major effect on students' opportunities for future advancement in the subject as it hinders students' access to the field. Moreover, it is dangerous for students morale if they are not given equal chance, and specially if they realize that they are being treated differently from their counterparts.

This situation might have resulted from inappropriate training of teachers, their carelessness or forgetting to use their pedagogical and psychological knowledge. Therefore, it seems highly important to give serious attention to pedagogical and psychological courses and provide teachers with in service training to refresh their pedagogical and psychological knowledge and skills.

3. From the result it seems that boys and girls were treated by their teachers in somewhat different ways in physics classroom interactions. Available evidences clearly indicates that it is unreasonable and non-professional to treat students differently because of their gender difference or perceive male and female students differently. This could happen due to teachers being unaware about their gender differentiating verbal teaching behaviours. To minimize the problem, teachers should get gender sensitive seminars and workshops in relation to their teaching.

4. Female students, as compared to their counterparts, seem to interact less with their teachers in these physics classes. Therefore, teachers, counsellors, and administrators should pay special attention to problems of female students in classroom interactions and set up programs that could help girls to be actively

involved during physics classroom interactions.

5. Results of the study showed that girls were less initiated, and had low classroom-talk than their male peers during physics instruction in these classes. This could mean that they failed to express their feelings and ideas, and to ask questions about their academic problems during these classroom interactions. Therefore, schools should develop ways such as workshops, seminars etc. to sensitize girls on gender issues in relation to these problems and their possible solutions.

6. Finally, there are numerous other problems in teachers' teaching behaviours that restrict effective pupil-teacher classroom interactions. Hence, to give a more complete picture, studies on various subjects and different levels of schooling should be conducted.

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APPENDIX A

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF CURRICULUM AND INSTRUCTION

TRAINING MANUAL

Introductory Remarks on the Material

This training manual is designed to provide basic skills on Flanders' Classroom Interaction Analysis technique of observation to observers who are going to participate in the main data gathering process. The manual consists of three parts. The first part presents explanation of the ten categories, and the second part provides basic exercises on these categories and observation technique. The last part contains a matrix that helps trainees practice coding the verbal classroom interaction in a classroom interaction process and a video recording.

It is intended that after the training each observer:

- understands the meaning of each category and memorize the code symbols.
- is proficient in coding the classroom verbal interaction with the necessary speed and accuracy.
- is familiar to matrix that is to rate terete the teaching behaviour in the classroom.

PART ONE

EXPLANATION OF CATEGORIES

To be familiar with and understand the categories read the explanation given under each category and try to understand and memorize the ten code symbols associated with each one of them. You have to be able to remember each code symbol without asking yourself what is category 1, 2 or 9?

CATEGORY 1

Acceptance of feelings:- It consists of the teacher's statements which accept and clarify attitude or feeling tone of pupil in a non threatening manner. The teacher understands the feelings of each student or the class as a whole and expresses his acceptance in different ways recognizing their rights to express positive or negative feelings and assuring them that he is not going to punish them for it. It includes predicting or recalling feelings.

EXAMPLE

T: My! But the class seems excited. Tell me what happened on the field in your sport period (1).

T: Abebe you don't seem to participate today. What is the matter: Are you ill? (1)

T: Almaz! You don't seem to follow Haven't you understood the first statement? (1)

S: Yes, teacher. You were so fast explaining that part (g)

T: Oh! you are right I was fast, I will explain that part again (1).

CATEGORY 2

Praises or Encourages:- Praise and encouragement are statements which carry the value judgement of approval. It includes joke, that release tension, but not those that threaten pupils or are made at the expense of individuals. Often, praise is a single word like 'good', 'fine', or 'right', sometimes the teacher simply says, 'I like what you are doing!' Encouragement may also include statements such as, 'go on', 'go ahead with what you are saying', tell us more about it. That is, showing pupil that the student is on the right track and the teacher would like her/him to go on.

EXAMPLES

T: What is different in the structure of solids when compared to the structure of liquids? (4)

S: In liquids the particles are tightly packed, but the forces between the particles of liquids are less than the forces between the particle of solids (8).

T: Bravo! Good boy, Almaz also can tell us other differences (2,4).

S: Liquids have definite volume but have no definite shape and their parts can be easily separated but solids do not (8).

T: You are right! Ayele also can tell us some more. (2,4)

S: Solids cannot be easily separated and they have their own shapes (8)

T: Fine! You remember the decision of the last time don't you? (2,4)

CATEGORY 3

Accepts or uses ideas of pupil:- This category is quite different to category one, it includes only acceptance of students' ideas, not acceptance of expressed emotions. A teacher can respond to the ideas a pupil expresses by acknowledging the pupil's idea by repeating it, modifying the idea, words, comparing the idea, summarizing what was already said by the pupil.

EXAMPLES

S: According to the principle of conservation of energy, the amount of heat lost by hot substances is equal to the quantity of heat gained by cold substances. (9)

T: Ayalew says in short that heat lost is equal to heat gained. (3)

S: When two substances with different temperatures are mixed, the hotter one loses some heat and the colder one gains it. (9)

T: As almaz puts it, hotter substances transfer their heat to colder ones and the amount of heat gained is equal to the amount of heat lost. (2,3)

CATEGORY 4

Asks Questions:- This category includes only questions to which the teacher expects an answer from the pupil. Not all questions are categorized under this. For instance, if a teacher asks a question and follows immediately with a statement of opinion or continues explaining something or lecturing, obviously the question is not meant to be answered, a rhetorical question is not categorized under four. For instance, if the teacher says "Kiros what is the time now?" (with proper intonation)(,) so this statement should be categorized under seven since the teacher is criticizing Kiros.

EXAMPLES

T: What have we discussed last time? (4)
S: About heat. (8)
T: What have we discussed about heat? (4)
S: About the amount of heat in the body. (8)
T: No. It means you were only physically present in the class. (7)
S: It was about the amount of heat needed to heat a substance. (8)

CATEGORY 5

Lecturing:- Expressing openions, giving facts, interjecting thoughts and off hand comments, all are classified in this category. Because it usually has the highest frequency, an incorrect tally would be least likely to distort the teacher's profile, compared to some other categories.

CATEGORY 6

Giving Directions:- The decision about whether or not to classify a statement as a direction a command must be based on the degree of freedom that the pupil has in response to teacher's directions. For example, when the teacher says, "Will you all stand-up and stretch your hands' he is obviously giving direction.

EXAMPLES

T: Please take out your physics textbook and turn to page five. (6)

T: Read part one, and I want you to think about if for a little while. (6)

T: Almaz, clean the blackboard. (6)

T: Next week, we will have an educational visit to a factory, so everybody should come prepared. (6)

CATEGORY 7

Criticizing and Justifying Authority:- A statement of criticism is one that is designed to change students behaviour from a non acceptable to an acceptable one. The teacher is saying, in effect, I don't like what you are doing, do something else. Other group of statements included in this category are those that might be called statements of self-justification. These statements particularly are difficult to detect when a teacher appears to be explaining a lesson or the reasons for dealing with a lesson for the class. If a teacher is explaining himself against the pupil, or justifying himself, these statements that fall into this category are those of extreme self-reference or those in which a teacher consistently asks the children to do something as a special favour to the teacher.

EXAMPLES

T: One of your troubles is that you forget to follow directions. (7)

T: Chaltu, you always come late. (7)

CATEGORY 8

Pupil Talk - Response:- The category is used when the teacher has initiated the contact or has solicited pupil statements, when the pupil answers a question asked by the teacher or when the pupil responds verbally to a direction given by the teacher. Anything that the pupil says

that is clearly in response to an initiate by the teacher belongs to category 8.

EXAMPLES

T: What are the common properties of physical bodies? (4)

S: Every physical body consists of one or more substance. (8)

T: Almaz will add the rest. (4)

S: Physical bodies have certain volume and cannot occupy the same space at the same time. (8)

CATEGORY 9

Pupil - Talk - Initiation:- If the pupil raises his/her hand to make statements or to ask questions when he/she has not been asked to do so by the teacher, nine is the appropriate category. Eight and nine are categories difficult to distinguish. In making distinction between the two, predicting the general kind of answer that the student will give in response to a question from the teacher is important. If the answer is one that is of a type predicted by the observer (as well as the teacher) then the statement comes under category 8. When in response to a teacher question the student gives an answer different from the particular question, then the statement should be categorized under 9.

EXAMPLES

T: A book on a table will not move unless there is a force to start its movement which law states about the last statement? (4)

S: The law of inertia or Newtons first law. (8)

S: Doesn't the law of inertia tell us about the condition of the book, how it stops moving. (9)

CATEGORY 10

Silence and Confusion:- Category ten is used when there is a pause, noise or confusion. In recording a series of 10's for longer than one or two minutes we put the event.

PART TWO

EXERCISES

ASSIGNMENT ONE

Answer the following questions without referring back to the explanation of categories.

1. When the teacher is talking, you select a code number from _____ to _____.
2. When the pupils are takings, you select either _____ or _____.
3. When the teacher statements respond to feelings or attitudes, encourage or make use of pupil's ideas, the three code numbers you select are _____, _____ and _____.
4. When teacher statements initiate, the three code numbers you select are _____, _____ and _____.
5. Pupil statements showing initiation are coded with the number _____.
6. When the teacher is talking, the response categories are numbers _____, _____ and _____.
7. Pupil statements in response to the teacher are coded by the number _____.
8. The initiation categories are _____, _____ and _____.
9. Pupil's response are coded with _____ and pupil initiation with _____.
10. Students talk is coded with the numbers _____ and _____.

ASSIGNMENT TWO

Give the key words for the following code symbols (answer the questions without referring to explanation of categories).

10 _____ 5 _____

3 _____ 1 _____

6 _____ 9 _____

4 _____ 7 _____

8 _____ 2 _____

ASSIGNMENT THREE

Put the correct code symbol for The following Flanders' categories. Don't refer to the explanations.

_____ Pupil-talk response
_____ Criticizing and justifying authority
_____ Praises and encourages
_____ Asking questions
_____ Pupil-talk initiation
_____ Acceptance of feelings
_____ Giving directions
_____ Lecturing
_____ Silence and Confusion
_____ Lecturing

ASSIGNMENT FOUR

Put the correct code symbol without referring back to the explanation of categories.

1. The teacher clarifies the feeling of the pupil in a non-threatening way.
2. The teacher's words or statements of criticism towards changing students bad behaviour.
3. The teacher accepts feelings of students, whatever it is, and shows his willingness to respond to it and shows that he is not going to punish them for their feelings _____.
4. When the student raises his/her hand to make a statement when not asked to do so _____.
5. The teacher asks a question expecting an answer from the pupil.
6. The teacher tries to release students' tension by telling jokes _____.
7. When a student makes a suggestion and the teacher uses it paraphrasing the statement that the student has made _____.
8. When the teacher says "Almaz open the window" _____.
9. Pupils talk in response to the teacher's initiation _____.
10. The teacher says 'time', 'good', 'bravo' to the students statement _____.

11. Teacher clarifies the student's feelings, summarizing it _____.
12. The teacher says "Abebe, stop writing and listen attentively _____.
13. The students' statements in response to the teacher's talk _____.
14. Student's statements with out teacher initiation _____.
15. Teacher utters and showing his authority _____.

ASSIGNMENT FIVE

Choose the correct category without referring to the explanation of Flander's categories.

1. The student's positive or negative feelings are accepted by the teacher.
   a) accepting ideas
   b) justifying authority
   c) acceptance of feelings
   d) a and b

2. When students start talking in the classroom interaction, we select codes:
   a) 1 and 2
   b) 5, 6 and 7
   c) 8 and 9
   d) 7 and 8

3. In the classroom interaction process as an observer, when one kind of interaction persists, what will you do as an observer?
   a) you stop recording
   b) you note the code repeatedly in a 3 second internal
   c) you write an x to show the continuity of the interaction
   d) you completely stop recording until the pattern changes.

4. The teacher in the classroom interaction says good', 'right', or 'time'. This is categorized under?
   a) 1
   b) 3
   c) 2
   d) 9

5. When the teacher gives classroom work, or when silence is observed in the classroom for a short time.
   a) you stop recording
   b) you write the time lost
   c) you put 10 on the matrix
   d) you will tell the teacher to continue

6. When the student's statements are in response to teacher's talk, you write the number _____.

a) 9
b) 8
c) 7
d) 8 and 9

7. The student's activities in response to teacher's words are coded under.

a) 9
b) 1
c) 7
d) 3

8. When teacher's statements are to correct pupil's answers or to threaten them.

a) 4
b) 8
c) 7
d) 7 and 4

9. The teacher's words expecting response from the students are coded under.

a) 8
b) 9
c) 1
d) 8 and 9

10. Pupil statements forwarded of their own initiative are coded under.

a) 1 and 2
b) 4 and 6
c) 8
d) 9

ASSIGNMENT SIX

Put the correct code number from column II against the appropriate statement (phrase) in column I (teacher's talk student's talk). Each code number can be used once or more than once.

	I	II
_____	a. Pupil talk response	9,7,3
_____	b. I appreciate your statements	1,4,8
_____	c. Abebe gave the answer to the question	2,6

_____ f. Ayalew asked a question without the teacher's concent or cue.

_____ g. Ayele, not asked to do so, gave his assumptions about heat

_____ h. "Ayele! Don't come late from today on wards"

_____ i. The teacher paraphrased Eshete's statements

_____ j. The teacher said "all of you stand up"

_____ k. Ayele you have to avoid silly mistakes.

_____ l. Almaz you don't answer because you don't read

_____ m. All of you should submit the assignment tomorrow

_____ n. Open your books on page 6

_____ o. I want all of you to think about it for a while

ASSIGNMENT SEVEN

Identify the following teacher's talk and pupil's talk and put the correct code number in the space provided. Put (T) for the teachers and (P) for student talk.

1. Don't come late from today onwards _____.
2. OK, Sir I will not _____.
3. Do you know the physics activities _____. Performed to study nature? Who can remember the discussion of last time _____.
4. No sir _____.
5. You don't answer because you don't regularly come to school _____.
6. Class, please be attentive _____.
7. As I have taught you before, the activities in physics are observe process, describe observation, measure physical qualities _____.
8. Gemechu, can you add some more _____.

9. Have you understood _____.
10. Please open your books and look at page 5 _____.
11. Read the part on the different physics activities performed to study nature _____.
12. Write the process of the different activities and give examples where physics knowledge is used _____.
13. Today we are starting a new topic _____.
14. Open your books on page 5 and scan through them _____.
15. Now turn to page 6 where you will find an illustration _____.
16. Bravo Almaz! Teshome can you add some more _____.
17. Now all of you read the statements under the illustration _____.
18. OK! let's see if we have all understood it _____.
19. What do we mean by application of knowledge _____.
20. We can apply the natural laws and discover the unknown ones for the benefit of man _____.
21. You are right Kiros, the laws so far discovered are used for the benefits of mankind to develop his life _____.
22. The laws are useful, for instance, a pocket calculator, a TV set, an aeroplane, etc. is the result of studying the natural laws _____.
23. Consider also a transistor radio, a camera, they all serve mankind _____.
24. Machine _____.
25. An Aeroplane _____.
26. Bravo! Hiwot and Bisrat gave good examples, who can add another example? _____
27. Electricity _____.
28. Ayele's example is a good one, electricity, which is very useful for human life by understanding and using its principles and laws is a result of physics.
29. So to get this benefits mankind studies physics and that is why you are learning it _____.
30. Have you understood _____.
31. Well, for the next day, all of you try the problems on page 7 _____.
32. Have you got it _____.
33. Yes, sir we will try _____.

34. Look at the problems, and if you have any problem you can ask me _____.
35. Sir, are we going to draw the pictures also _____.
36. Yes, draw all the pictures, then based on the pictures you solve the problems _____.
37. You have to do it on a separate paper, do not write it in your exercise books _____.
38. Boys and girls, may I have your attention please? _____.
39. The assignment will be corrected out of 10 _____.
40. It must be submitted next Monday _____.

PART III

Exercises to be performed in a live classroom interaction process.

The exercises below are provided to help observers (trainees) practice coding the verbal communication in the interaction process. It is intended to make the observers gain more experience in coding so that they will be effective during the actual data collecting process in recording the verbal classroom interaction. The assignments must be done according to their sequence. Before you start the observation, select a seat that could enable you see and hear the interaction clearly. This should be done without disturbing the attention of students.

FIRST OBSERVATION PERIOD

ASSIGNMENT 8

Record each statement of the teacher and pupil in the live classroom interaction process by writing addition sign (+) to each code for female students.

Example

The teacher says "keep quiet listen to me" then you write 6.
If a female student says "when are you going to give us the quiz?" you write 9+

SECOND OBSERVATION PERIOD

ASSIGNMENT 9

Using your tally sheet, show the form of interaction as indicated below. Each mark indicates a single student or teacher statement

Example

T = //// //// //// //

M = //// //// //// /

F = //// //// /// ///

after you finish the above observation periods, tally (record) the classroom interaction in three seconds interval using the following tally sheet and calculate the tally marks in each cell and find the percentage of each category.

ASSIGNMENT 10

	Categories	Tallies
	1. Accepts feelings	//// //// //// //
	2. Praises or encourages	//// //// /// /
	3. Accepts or uses ideas of students	//// //// //// //
	4. Asks questions	//// //// //
	5. Lecturing	//// //// //// ////
	6. Gives directions	//// //// /
	7. Criticises or justifies authority	//// //
	8. Pupil talk response	//// //// /
	9. Pupil talk initiation	//// //// //
	10. Silence and confusion	//// //// /

Categories	Completed Tally Marks		Tally Marks Percent			
	M	F	M	F	M	F
1	//// /	///	6	3	6.25	4.05
2	//// //// //	//// ////	12	9	12.5	12.16
3	///	//	3	2	3.13	2.70
4	//// //// //// /	//// //// /	16	11	16.67	14.87
5	//// //// //// ////	//// //// //// ////	20	20	20.83	27.03
6	//// //	////	7	4	7.29	5.41
7	///	//	3	2	3.13	2.70
8	//// //// ///	//// ////	13	9	13.54	12.16
9	//// /	////	6	4	6.25	5.41
10	//// ////	//// ////	10	10	10.41	13.51
Total			96	74	100	100

APPENDIX B

Inter-Observer Agreement Between Observers Observer A and B

Categories		Observer A	Observer B	%A	%B	% Difference	Average ($\%^2$)
1	F	-	-	-	-	-	-
	M	-	-	-	-	-	-
2	F	-	-	-	-	-	-
	M	-	-	-	-	-	-
3	F	6	6	1.20	1.20	0	0.01
	M	7	7	1.38	1.39	0.01	0.02
4	F	18	14	3.58	2.79	0.39	0.10
	M	19	14	3.76	2.79	0.97	0.11
5	F	404	405	80.48	80.84	0.36	65.05
	M	404	405	79.84	80.68	0.84	64.41
6	F	3	3	0.60	0.60	0	0.00
	M	4	2	0.79	0.40	0.39	0.00
7	F	-	-	-	-	-	-
	M	1	-	0.20	-	0.20	0.00
8	F	7	12	1.39	2.40	1.01	0.03
	M	8	12	1.58	2.39	0.81	0.03
9	F	2	1	0.40	0.20	0.20	0.00
	M	1	2	0.20	0.40	0.20	0.00
10	F	62	60	12.35	11.97	0.38	1.47
	M	62	60	12.25	11.95	0.3	1.46
Total	F	502	501	100	100	2.34	66.66
	M	506	502	100	100	3.72	66.03

Female $P_1 = \frac{P_0 - P_c}{100 - P_c}$

$P_1 = \frac{(100 - 2.34) - 66.66}{100 - 66.66}$

$= 0.989$

Male $P_1 = \frac{P_0 - P_c}{100 - P_c}$

$P_1 = \frac{(100 - 3.72) - 66.03}{100 - 66.03}$

$= 0.890$

Where P_1 = reliability
P_0 = agreement between observers
P_c = agreement between observers that occur simply by chance.

Inter-Observer Agreement Between Observers
Observer A and C

Categories		Observer A	Observer C	%A	%C	% Difference	Average ($\%^2$)
1	F	-	-	-	-	-	-
	M	-	-	-	-	-	-
2	F	-	-	-	-	-	-
	M	-	-	-	-	-	-
3	F	6	6	1.20	1.79	0.59	0.02
	M	7	8	1.3w8	1.54	0.16	0.02
4	F	18	16	3.58	3.18	0.49	0.11
	M	19	18	3.76	3.46	0.3	0.12
5	F	404	407	80.48	80.75	0.27	64.66
	M	404	407	79.84	78.12	1.72	62.35
6	F	3	4	0.60	0.79	0.19	0.00
	M	4	3	0.79	0.58	0.21	0.00
7	F	-	-	-	-	-	-
	M	1	2	0.20	0.38	0.10	0.00
8	F	7	4	1.39	0.79	0.06	1.01
	M	8	18	1.58	3.45	1.87	0.06
9	F	2	1	0.40	0.20	0.20	0.00
	M	1	2	0.20	0.38	0.18	0.00
10	F	62	63	12.35	12.5	0.15	1.54
	M	62	63	12.25	12.09	0.16	1.48
Total	F	502	504	100	100	1.86	67.34
	M	506	521	100	100	4.7	64.03

Female $P_1 = \frac{P_0 - P_c}{100 - P_c}$

$P_1 = \frac{(100 - 1.86) - 67.34}{100 - 67.34}$

$= 0.943$

Male $P_1 = \frac{P_0 - P_c}{100 - P_c}$

$P_1 = \frac{(100 - 4.7) - 64.03}{100 - 64.03}$

$= 0.869$

Inter-Observer Agreement Between
Observer B and C

Categories		Observer	Observer C	%B	%C	% Difference	Average ($\%^2$)
1	F	-	-	-	-	-	-
	M	-	-	-	-	-	-
2	F	-	-	-	-	-	-
	M	-	-	-	-	-	-
3	F	6	6	1.20	1.79	0.59	0.02
	M	7	8	1.39	1.54	0.15	0.02
4	F	14	16	2.79	3.18	0.39	2.98
	M	14	18	2.79	3.46	0.67	0.09
5	F	405	407	80.84	80.75	0.09	65.27
	M	405	407	80.68	78.12	2.56	63.00
6	F	3	4	0.60	0.79	0.19	0.00
	M	2	3	0.40	0.58	0.18	0.00
7	F	-	-	-	-	-	-
	M	-	2	-	0.38	0.38	0.00
8	F	12	4	2.40	0.79	1.61	1.59
	M	12	18	2.39	3.45	1.06	0.08
9	F	1	1	0.20	0.20	0.00	0.00
	M	2	2	0.40	0.38	0.02	0.00
10	F	60	63	11.79	12.5	0.53	1.49
	M	60	63	11.95	12.09	0.14	1.44
Total	F	501	504	100	100	3.4	71.35
	M	502	521	100	100	5.16	64.63

Female $P1 = \frac{P_o - P_c}{100 - P_c}$

$P_1 = \frac{(100 - 3.4) - 71.35}{100 - 71.35}$

$= 0.881$

Male $= \frac{P_o - P_c}{100 - P_c}$

$P1 = \frac{(100 - 5.16) - 64.63}{100 - 64.63}$

$= 0.854$

APPENDIX C (1 - 14)
Individual Master-Matrices of Physics Teachers in Which the Master-Master Matrix was based
Master - Matrix One

Category	Teacher							Pupil		10	Total	%
	1	2	3	4	5	6	7	8	9			
1 F	-	-	-	-	-	-	-	-	-	-	-	-
1 M	5	6								3	14	0.59
2 F	-	-	-	-	2	-	-	-	-	2	4	0.17
2 M	-	3			7					8	18	0.76
3 F	-	-	4	5	23	-	-	-	-	-	32	1.42
3 M	-	-	15	7	32	-	-	1	-	1	56	2.37
4 F	-	-	12	-	-	-	-	39	-	21	72	3.18
4 M	-	-	-	17	-	-	-	43	-	21	81	3.42
5 F	-	-	-	45	1751	-	-	-	1	27	1824	80.60
5 M	-	-		57	1751	-	-	-	2	33	1843	77.86
6 F	-	-	2	-	-	-	-	-	-	-	2	0.09
6 M	-	-	-	-	-	3	-	-	-	-	3	0.13
7 F	-	-	-	-	-	1	-	-	-	-	1	0.04
7 M	-	-	-	-	-	-	2	-	-	-	2	0.08
8 F	-	4	25	1	10	-	1	12	-	11	64	2.83
8 M	-	9	32	-	18	-	-	17	-	2	78	3.30
9 F	-	-	1	-	-	-	-	-	-	-	1	0.04
9 M	-	-	2	-	-	-	-	-	-	-	2	0.08
10 F	-	-	-	9	38	1	-	13	-	202	263	11.63
10 M	9	-	7	-	35	-	-	17	-	202	270	11.41
Total F	-	4	32	72	1824	2	1	64	1	263	2263	100
Total M	14	18	56	81	1843	3	2	78	2	270	2367	100

Master - Matrix Three

Category	Teacher							Pupil		10	Total	%
	1	2	3	4	5	6	7	8	9			
F1	-	-	-	-	-	-	-	-	-	-	-	-
M	1	-	-	-	-	-	-	-	-	4	5	0.25
F2	-	-	-	-	-	-	-	-	-	-	-	-
M	-	2	-	-	-	-	-	-	-	5	7	0.35
F3	-	-	-	-	-	-	-	-	-	2	2	0.10
M	-	-	1	-	-	-	-	2	-	4	7	0.35
F4	-	-	-	7	2	-	-	13	-	6	28	1.47
M	-	-	-	12	5	1	-	28	-	3	49	2.46
F5	-	-	-	3	1529	-	-	6	-	19	1557	81.86
M	-	-	-	8	1529	-	-	14	3	22	1576	79.04
F6	-	-	2	-	1	-	-	-	-	9	12	0.63
M	-	-	-	6	-	-	-	-	-	4	10	0.50
F7	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	-	-	-	-	7	-	-	2	9	0.45
F8	-	-	-	4	2	2	-	3	-	29	40	2.11
M	-	-	3	11	-	-	-	-	-	32	46	2.31
F9	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	-	-	-	-	1	-	-	5	6	0.30
F10	-	-	-	14	23	10	-	18	-	198	263	13.83
M	4	5	3	12	42	9	1	2	3	198	279	13.99
F Total	-	-	2	28	1557	12	-	40	-	263	1902	100
M	5	7	7	49	1576	10	9	46	6	279	1994	100

10	Total	%
-	4	0.20
5	15	0.68
-	22	1.09
-	28	1.28
5	7	0.35
5	12	0.55
16	51	2.52
9	75	3.42
16	1553	76.81
30	1582	72.11
-	23	1.14
-	65	2.96
-	-	-
-	6	0.27
34	52	2.57
22	85	3.87
3	9	0.44
-	28	1.28
227	301	14.88
227	298	13.58
301	2022	100
298	2194	100

Master - Matrix Five

Category		Teacher							Pupil		10	Total	%
		1	2	3	4	5	6	7	8	9			
1	F	2	-	-	3	8	-	-	6	1	5	25	1.17
	M	5	-	-	8	16	-	-	13	4	3	4	2.14
2	F	3	5	3	5	5	2	-	7	1	16	47	2.21
	M	7	9	6	9	11	4	-	15	3	-	64	2.80
3	F	-	-	1	-	2	-	-	-	3	6	12	0.56
	M	-	7	6	-	6	-	-	-	7	-	26	1.14
4	F	-	6	-	15	-	-	-	21	-	-	42	1.97
	M	-	13	-	22	3	-	-	35	-	-	73	3.19
5	F	3	5	-	4	1578	5	3	9	-	5	1612	75.68
	M	5	8	-	9	1578	14	6	17	-	7	1644	71.88
6	F	-	-	-	3	5	8	3	7	2	7	35	1.64
	M	-	-	-	5	8	11	4	9	3	1	41	1.80
7	F	1	1	-	-	2	1	7	3	-	-	15	0.70
	M	3	-	-	-	3	2	9	1	-	5	23	1.01
8	F	11	9	7	7	12	4	2	27	-	9	88	4.13
	M	17	19	11	9	14	6	4	39	-	10	129	5.64
9	F	1	2	1	1	-	2	-	-	1	3	11	0.53
	M	3	6	3	-	-	4	-	-	2	1	19	0.83
10	F	4	19	-	4	-	13	-	8	3	192	243	11.41
	M	9	2	-	11	5	-	-	-	-	192	219	9.58
Total	F	25	47	12	42	1612	35	15	88	11	243	2130	100
	M	49	64	26	73	1644	41	23	129	19	219	2287	100

Master - Matrix Six

Category	Teacher							Pupil		10	Total	%
	1	2	3	4	5	6	7	8	9			
1 F	-	-	-	-	-	-	-	-	-	-	-	-
1 M	2	-	-	2	-	-	-	-	-	-	4	0.18
2 F	-	-	-	2	1	-	-	-	-	6	9	.0.42
2 M	-	3	-	7	3	-	-	17	-	3	33	1.46
3 F	-	1	8	11	50	-	-	4	-	-	74	3.49
3 M	-	5	19	16	31	-	-	7	2	25	105	4.65
4 F	-	1	-	11	5	1	-	49	-	26	93	4.38
4 M	-	-	-	21	3	3	-	87	-	23	137	6.07
5 F	-	-	-	57	1267	5	-	2	7	65	1403	66.12
5 M	-	-	-	58	1267	5	-	3	14	6	1353	59.92
6 F	-	2	-	1	9	16	-	1	-	9	38	1.79
6 M	-	3	2	3	7	28	-	3	-	7	53	2.35
7 F	-	-	-	-	-	-	-	-	-	-	-	-
7 M	-	-	-	-	-	-	-	-	2	3	5	0.22
8 F	-	5	9	11	57	1	-	7	1	-	91	4.29
8 M	-	19	48	13	19	3	2	18	4	22	148	6.55
9 F	-	-	8	-	-	-	-	3	-	-	11	0.52
9 M	-	-	17	-	3	-	3	-	11	-	34	1.50
10 F	-	-	49	-	14	15	-	25	3	297	403	18.99
10 M	2	3	19	17	20	14	-	13	1	297	386	17.09
Total F	-	9	74	93	1403	38	-	91	11	403	2122	100
Total M	4	33	105	137	1353	53	5	148	34	386	2258	100

Master - Matrix Seven

Cat e-gor Y	Teacher							Pupil		10	Tota l	%
	1	2	3	4	5	6	7	8	9			
1 F	-	-	-	-	-	-	-	-	-	-	-	-
M	3	-	-	-	-	-	-	-	-	7	10	0.43
2 F	-	-	-	-	-	-	-	-	-	-	-	-
M	7	-	-	-	-	-	-	-	-	1	8	0.35
3 F	-	-	20	11	28	2	-	3	2	6	72	3.70
M	-	-	41	22	34	4	-	5	3	7	116	5.01
4 F	-	-	-	32	11	3	-	91	-	-	137	7.05
M	-	-	-	61	18	6	7	103	-	37	232	10.01
5 F	-	-	-	38	1207	-	2	14	-	43	1304	67.05
M	-	-	-	57	1207	7	3	28	-	37	1339	57.79
6 F	-	-	-	3	7	9	-	-	-	4	23	1.18
M	-	-	-	7	9	17	-	2	1	15	51	2.20
7 F	-	-	-	-	1	-	-	-	-	1	2	0.10
M	-	-	-	-	-	-	2	10	-	-	12	0.52
8 F	-	-	52	47	19	9	-	31	-	-	158	8.12
M	-	-	42	56	14	5	-	23	-	58	198	8.55
9 F	-	-	-	-	-	-	-	-	-	9	9	0.46
M	-	-	5	2	5	-	-	-	-	-	12	0.52
10 F	-	-	-	6	31	-	-	19	7	177	239	12.34
M	-	8	28	27	52	12	-	27	8	177	339	14.63
Total F	-	-	72	137	1304	23	2	158	9	240	1945	100
M	10	8	116	232	1339	51	12	198	12	339	2317	100

Master - Matrix Eight

Category	Teacher							Pupil		10	Total	%
	1	2	3	4	5	6	7	8	9			
1 F	-	-	-	-	-	-	-	-	-	-	-	-
1 M	-	-	-	-	-	-	-	-	-	1	1	0.05
2 F	-	2	-	-	-	1	-	4	-	21	28	1.34
2 M	-	6	-	3	5	-	-	14	-	-	28	1.36
3 F	-	-	-	-	-	-	-	-	-	-	-	-
3 M	-	-	-	2	1	-	-	-	-	-	3	0.15
4 F	-	-	-	14	5	-	1	21	1	17	59	2.82
4 M	-	-	2	15	-	-	-	36	5	13	71	3.47
5 F	-	2	-	3	1556	2	-	14	-	38	1615	77.09
5 M	-	-	-	7	1556	5	-	26	-	4	1598	78.03
6 F	-	-	-	-	-	2	2	-	1	1	6	0.29
6 M	-	-	-	-	-	7	3	-	3	3	16	0.78
7 F	-	-	-	-	-	-	3	-	-	3	6	0.29
7 M	1	-	-	2	-	1	4	-	-	1	9	0.44
8 F	-	3	-	18	6	-	-	17	1	39	84	4.00
8 M	-	9	-	36	21	-	-	28	-	14	108	5.27
9 F	-	-	-	-	1	1	-	-	1	5	8	0.38
9 M	-	-	1	-	3	-	2	-	3	2	11	0.54
10 F	-	21	-	24	47	-	-	28	4	165	289	13.79
10 M	-	13	-	6	12	3	-	4	-	165	203	9.91
Total F	-	28	-	59	1615	6	6	84	8	289	2095	100
Total M	1	28	3	71	1598	16	9	108	11	203	2048	100

Master - Matrix Nine

Category	Teacher							Pupil		10	Total	%
	1	2	3	4	5	6	7	8	9			
F1	-	-	-	-	-	-	-	-	-	-	-	-
M	-	2	3	-	-	-	-	-	-	3	8	0.35
F2	-	-	-	-	-	-	-	-	-	-	-	-
M	-	6	-	-	-	-	-	-	5	4	15	0.66
F3	-	-	1	-	-	-	-	-	1	5	7	0.33
M	-	-	3	-	3	-	-	-	3	3	12	0.53
F4	-	-	-	9	3	1	-	10	-	6	29	1.37
M	-	-	-	15	7	-	-	22	-	15	59	2.61
F5	-	-	-	7	1776	-	-	3	-	17	1803	85.01
M	5	-	-	17	1776	3	-	7	2	12	1822	80.59
F6	-	-	-	-	-	2	-	1	-	5	8	0.38
M	-	-	-	-	2	6	-	4	-	1	13	0.57
F7	-	-	-	-	-	-	-	-	-	-	-	-
M	2	-	-	-	-	-	2	-	-	3	7	0.31
F8	-	-	1	13	9	-	-	12	-	-	35	1.65
M	-	-	4	22	16	4	-	17	3	-	66	2.92
F9	-	-	1	-	-	-	-	-	-	1	2	0.09
M	-	7	-	3	2	-	-	3	-	-	15	0.66
F10	-	-	4	-	15	5	-	9	1	203	237	11.17
M	1	-	2	2	16	-	5	13	2	203	244	10.79
F Total	-	-	7	29	1803	8	-	35	2	237	2121	100
M	8	15	12	59	1822	13	7	66	15	244	2261	100

Master - Matrix Eleven

Category	Teacher							Pupil		10	Total	%
	1	2	3	4	5	6	7	8	9			
F1	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	1	-	-	-	-	-	1	3	5	0.22
F2	-	-	1	-	-	-	-	-	-	5	6	0.29
M	2	-	5	-	2	-	-	-	-	-	9	0.40
F3	-	-	2	10	3	-	-	1	2	1	19	0.94
M	1	-	7	-	12	-	-	4	6	2	32	1.43
F4	-	-	-	10	6	-	-	18	-	7	41	2.03
M	-	-	-	28	11	-	-	32	-	16	87	3.88
F5	-	-	-	-	1624	-	-	1	-	21	1646	81.53
M	-	-	-	21	1624	-	-	3	-	28	1676	74.69
F6	-	-	-	1	-	1	-	-	-	12	14	0.69
M	-	-	-	-	-	7	-	-	-	20	27	1.20
F7	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	-	-	-	-	7	-	-	-	7	0.31
F8	-	3	4	6	-	-	-	9	-	7	29	1.44
M	-	8	9	14	17	-	-	22	-	1	71	3.16
F9	-	-	-	-	-	-	-	-	-	2	2	0.10
M	-	1	-	-	-	-	-	-	-	26	27	1.20
F10	-	3	12	14	13	13	-	-	-	207	262	12.97
M	2	-	10	24	10	20	-	10	20	207	303	13.50
F Total	-	6	19	41	1646	14	-	29	2	262	2019	100
M	5	9	32	87	1676	27	7	71	27	303	2244	100

Master - Matrix Twelve

Category		Teacher							Pupil		10	Total	%
		1	2	3	4	5	6	7	8	9			
1	F	-	-	-	-	-	-	-	-	1	2	3	0.15
	M	-	2	-	-	-	-	-	-	3	3	8	0.36
2	F	-	1	-	-	-	-	-	3	-	-	4	0.20
	M	2	4	-	-	2	-	-	8	-	-	16	0.71
3	F	-	-	-	-	-	-	-	-	-	-	-	-
	M	-	-	2	-	-	-	-	-	3	1	6	0.27
4	F	-	-	-	2	3	-	-	13	-	-	18	0.88
	M	-	-	-	5	-	-	-	27	-	3	35	1.56
5	F	-	-	-	14	1494	-	-	-	-	102	1610	78.88
	M	-	-	-	22	1494	-	3	-	3	139	1661	73.89
6	F	-	-	-	-	-	1	-	-	-	3	4	0.20
	M	2	-	-	-	8	4	-	-	-	-	14	0.62
7	F	-	-	-	-	-	-	-	-	-	-	-	-
	M	-	-	-	-	-	-	-	-	3	-	3	0.13
8	F	-	1	-	2	7	-	-	11	-	9	30	1.47
	M	-	3	-	8	27	-	-	19	8	5	70	3.11
9	F	2	-	-	-	-	3	-	-	-	-	5	0.24
	M	1	-	-	-	-	8	-	-	2	11	22	0.98
10	F	1	2	-	-	106	-	-	3	4	251	367	17.98
	M	3	7	4	-	130	2	-	16	-	231	413	18.37
Total	F	3	4	-	18	1610	4	-	30	5	367	2041	100
	M	8	16	6	35	1661	14	3	70	22	413	2248	100

Master - Matrix Threteen

Category	Teacher							Pupil		10	Total	%
	1	2	3	4	5	6	7	8	9			
F1	-	-	-	-	-	-	-	-	-	-	-	-
M	5	-	-	-	-	-	-	-	-	-	5	0.22
F2	-	1	-	-	1	-	-	-	2	2	6	0.29
M	-	1	1	1	3	-	-	2	5	2	15	0.67
F3	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	5	1	3	1	-	-	-	-	10	0.45
F4	-	-	-	8	1	-	-	12	1	23	45	2.18
M	-	-	-	21	3	-	-	33	4	18	79	3.45
F5	-	-	-	12	1633	-	2	1	1	-	1649	79.85
M	-	3	1	23	1633	1	3	4	4	5	1677	75.20
F6	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	-	-	1	-	-	1	-	-	2	0.79
F7	-	-	-	-	2	-	-	-	-	-	2	0.09
M	-	-	-	-	4	-	1	1	-	-	6	0.27
F8	-	2	-	10	6	-	-	18	4	-	40	1.94
M	-	7	-	25	16	-	-	32	9	-	89	3.99
F9	-	1	-	2	2	-	-	2	1	1	9	0.44
M	-	4	3	5	8	-	2	5	7	-	34	1.52
F10	-	2	-	13	4	-	-	7	-	288	314	15.20
M	-	-	-	3	6	-	-	11	5	288	313	14.04
F Total	-	6	-	45	1649	-	2	40	9	314	2065	100
M	5	15	10	79	1677	2	6	89	34	313	2230	100

Master - Matrix Fourteen

Category	Teacher							Pupil		10	Total	%
	1	2	3	4	5	6	7	8	9			
1 F	-	-	-	-	-	-	-	-	-	-	-	-
1 M	8	-	-	-	-	-	-	-	-	-	8	0.35
2 F	-	6	9	5	-	-	-	1	-	-	21	1.03
2 M	-	14	17	11	2	1	-	4	-	-	49	2.15
3 F	-	1	2	4	2	-	-	2	-	8	19	0.93
3 M	-	5	8	12	9	1	1	7	1	-	44	1.93
4 F	-	1	-	12	3	1	-	22	-	-	39	1.92
4 M	-	-	-	25	7	3	-	41	-	11	87	3.83
5 F	-	-	-	6	1648	-	-	6	-	7	1667	82.12
5 M	-	-	-	13	1648	3	-	15	1	16	1696	74.58
6 F	-	-	-	-	-	8	-	-	-	1	9	0.44
6 M	-	-	-	-	4	12	2	-	-	3	21	0.92
7 F	-	-	-	5	-	-	5	-	-	5	15	0.73
7 M	-	-	-	11	2	-	12	6	4	-	35	1.54
8 F	-	5	2	7	5	-	2	5	2	7	36	1.77
8 M	-	16	9	15	9	-	4	12	6	14	85	3.74
9 F	-	-	1	-	-	-	-	-	-	1	2	0.09
9 M	-	-	4	-	-	1	6	-	-	1	12	0.53
10 F	-	8	5	-	9	-	8	-	-	192	222	10.93
10 M	-	14	6	-	15	-	10	-	-	192	237	10.42
Total F	-	21	19	39	1667	9	15	36	2	222	2030	100
Total M	8	49	44	87	1696	21	35	85	12	237	2274	100

Appendix D

T-test for Proportions

pim	pif	nm*pim	nf*pif	pim - pif	pmfi	sep1	sep2	sep12	se(pim-pif)	t-calcualted*
0.43	0.11	13453.84	3192.86	0.32	0.2760006	0.000880	0.000948	0.0018	0.0428	7.4846
1.05	0.6	32852.4	17415.6	0.45	0.8334383	0.002642	0.002847	0.0055	0.0741	6.0739
1.9	1.02	59447.2	29606.52	0.88	1.4765016	0.004649	0.005012	0.0097	0.0983	8.9530
4.23	2.86	132348.24	83014.36	1.37	3.5706901	0.011005	0.011862	0.0229	0.1512	9.0597
72.6	77.39	2270257.3	2246322.1	-4.83	74.884428	0.060111	0.064796	0.1249	0.3534	-13.6664
1.08	0.63	33791.04	18286.38	0.45	0.8634383	0.002736	0.002949	0.0057	0.0754	5.9683
0.42	0.17	13140.96	4934.42	0.25	0.299688	0.000955	0.001029	0.0020	0.0445	5.6122
4.67	3.13	146114.96	90851.38	1.54	3.9288779	0.012064	0.013004	0.0251	0.1583	9.7267
1	0.41	31288	11900.66	0.59	0.7160636	0.002272	0.002449	0.0047	0.0687	8.5864
12.7	13.68	396106.08	397075.68	-1.02	13.150873	0.036504	0.039349	0.0759	0.2754	-3.7035
100	100									

* .. all the calculated t statistics are gretear than, in absoulte value, the tabulated t value=1.96. Hence at 5% there exist statistical difference in proportions between males and females towards the ten different class room beviours.

APPENDIX - E (1 and 2)

1. A chi-square (X^2) for proportion of teachers talk, "pupil talk and" silence and confusion towards boys and girls (table II Chapter 4)

Ratios	Gender		N	X^2
	Male	Female		
Teacher Talk (TT)	81.66	82.78	68	5.95*
Pupil talk (PT)	5.66	3.53	20	27.12*
Silence and Confusion (SC)	12.67	13.68	12	0.27
Total	100	100		

N = Normative expectation of the ratio by Flanders Detail
Calculations of chi-square $X^2 \frac{(O - N)^2}{N}$

$$TT = X^2 = \frac{(81.65 - 68)^2}{68} + \frac{(82.78 - 68)^2}{68} = 5.95$$

$$ST = X^2 = \frac{(5.66 - 20)^2}{20} + \frac{(3.53 - 20)^2}{20} = 27.12$$

$$SC = X^2 = \frac{(12.67 - 12)^2}{12} + \frac{(13.68 - 12)^2}{12} = 0.27$$

2. A chi-square (X^2) for proportion of "Questioning" and other behaviour ratios towards boys and girls (Table III Chapter 4)

Ratios	Gender		N	X^2
	Male	Female		
Teacher Questioning Ration (TQR)	5.50	3.56	26	35.53*
Teacher Response Ratio (TRR)	69.16	68.34	42	34.02*
Pupil Initiation Ratio (PIR)	17.72	11.51	34	22.67*
Total	100	100		

Detail Calculations of Chi-square $X^2 \frac{(O - N)^2}{N}$

$$TQR = X^2 = \frac{(5.50 - 26)^2}{26} + \frac{(3.56 - 26)^2}{26} = 35.53$$

$$TRR = X^2 = \frac{(69.16 - 42)^2}{42} + \frac{(68.34 - 42)^2}{42} = 34.02$$

$$PIR = X^2 = \frac{(17.72 - 34)^2}{34} + \frac{(11.51 - 34)^2}{34} = 22.67$$

DECLARATION

I, the undersigned declare that this thesis is my work and that all sources of material used in the thesis have been duly acknowledged.

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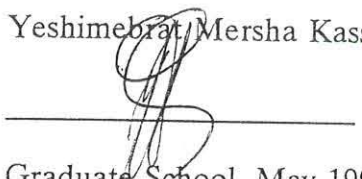
Signiture: 

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