

AN ANALYSIS OF VERBAL INSTRUCTIONAL
BEHAVIOUR OF TRAINED AND UNTRAINED
PRIMARY SCIENCE TEACHERS //

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BY

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"This thesis is my original work and has not been presented for a degree in any other University".



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"This thesis has been submitted for examination with my approval as University Supervisor".



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DEDICATION

To my sons Commy and Frank and my wife Pamela.

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ABSTRACT

This study derives its significance from the desire to have objective knowledge (as opposed to individual opinions) about competence of the large numbers of untrained teachers (UTs) in Kenyan Primary Schools.

The objective was to compare trained teachers (TTs) and untrained teachers (UTs) in their instructional behaviour and how this behaviour may facilitate learning in science classrooms. Teachers were held responsible for their verbal exchange and it was believed that pupils' learning and effective teaching are measurable through change-revealing observations. The sample comprised of 40 TTs and 40 UTs selected from 34 primary schools, teaching science in standards 6 and 7. Flanders' Interaction Analysis Category System (FIAC) was used to observe each teacher three times spread over a period of one school term. Data were analysed descriptively, by statistical t-test and regression analysis. In terms of facilitation of learning, it was found that TTs and UTs differ in their verbal instructional behaviour with TTs displaying slightly superior behaviour but the standard was generally low. Age and past experience of teachers were found to be significant factors but professional grade was not. Science

was found to be more taught by drill than by inquiry.

It emerged that TTs and UTs need in-service course but UTs need them more. Other recommendations were made to solve the untrained teachers' problem. It is hoped that the section of the Ministry of Basic Education concerned with Teacher Training will find this study useful and recommendations implementable.

CHAPTER ONE

THE PROBLEM

1.1. Introduction

Although there has been an increasing concern with the quality of teachers, we have always had two major categories thus, trained and untrained teachers. Kenyan formal educational system required a teacher to be trained for the job. In the pre-colonial era the idea of somebody being trained to teach would be meaningless as there existed teachers who taught others whatever knowledge they had in the mutually exclusive communities. Since there were no serious competitions among learners the quality of the teachers was irrelevant.

After establishing schools any of the colonizers could do the teaching. As more and more children were hired into schools, there arose a demand for more teachers and the Africans who had graduated from these schools were appointed teachers without any training. The element of competition was already being introduced among learners so that some standards could be set. It became necessary to train teachers so that the schools could produce desired graduates.

Trained teachers are believed to be more professionally competent than untrained teachers (UTs). Training of teachers is necessary for any country as every country normally has its philosophy of life that she requires her citizens to follow.

In formal education the importance of teacher education is almost equivalent to that of the pupils. The quality of the teacher determines the success of any educational system whose quality can never grow beyond that of its teachers. A country's educational system will determine the type of citizens she will breed. Most countries therefore aim at indoctrinating her citizens, through her educational system or otherwise, that her philosophy of life is the best. Such a big task would require teachers capable of converting national educational objectives into classroom instructional objectives.

When we have unqualified teachers can we be sure that what we want to happen in the classroom is what happens? Do we have to train teachers to be sure that children learn what is intended? In Kenya the policy has been to try to have only trained teachers in the schools. This has not been successful. The number of untrained teachers has kept on increasing. Why has the number of UTs kept on increasing? Kenya is one of the developing countries leading in the implementation of a United Nations' (UN) resolution for the Supplement of Universal Education. However, the going has not been easy.

In 1973 when the presidential decree¹ waived school fees in primary standards one to four, the country's problem of inadequate school teachers increased tremendously as a ministry of education official supports:

Kenya was already short of trained teachers prior to December, 1973 decree and though the classrooms were set up quickly, the shortage of trained teachers was more enhanced²

At this time Kenya had a teaching force of 56,000 primary school teachers out of which 12,600 were professionally unqualified (22.5%)³. An additional of 25,000 teachers were needed for the new classes. The teacher training colleges could produce only 3,000 teachers annually:

Hence we were obliged to make to do with many unqualified teachers as a short term measure⁴

By 1975 the number of UTs had risen to 44.4% of the primary school teaching force. This was a sharp increase and the situation was going out of control.

1. KENYATTA, J. "Four Years Free Education"
Daily Nation, 13th December, 1973
p.1. col. 3.

2. BIGALA, J.C.B. (Ed) ATTA Conference 1975
by Muhoro, J.M.G. "The Kenya Experience"
p. 35.

3. Ibid.

4. Ibid.

However, Kenya still went ahead to declare seven years free primary education. The declaration was partly to achieve a political commitment of the ruling party as is reflected in the following presidential message:

....I am pleased to announce the abolition of fees for standard seven. This now completes the commitment of the Kanu party to establish a free seven years primary education⁵

Following the above announcement the Teachers Service Commission (TSC) recruited 6000 UTs for primary schools⁶. On completing the above commitment the cost of education rose a great deal, since UTs are paid comparatively low salaries, such cheap labour is necessary if the country is to operate within its limited financial resources. The only problem is that this may be done at the expense of quality. It becomes necessary to provide teachers at all levels in adequate proportions and also to raise the quality of their training.

In developing countries alternative ways of educating the masses are very limited since many people are illiterate and know only a language.

5 MOI, D.T. "Primary School Fees Abolished"
The Standard, 2nd January, 1980, p.1. col.3.

6 EDUCATION NATION "TSC takes on 6000 new UTs"
Daily Nation, 5th February, 1980, p.9. col.2

Mass Education is therefore still ineffective and the teacher will for a long time remain the most important factor in the education of the people. It is still uncertain whether such an important task can be performed by professionally unqualified teachers.

1.2. Statement of the Problem

How do untrained teachers (UTs) compare with trained teachers (TTs) in classroom instructional behaviour?

In view of the growing concern about the classroom performance of UTs the objective in this study was to observe classroom teaching by UTs and compare it with similar observation of classes taught by TTs with the aim of finding if any instructional behaviour differences exist and the implications of any such differences. The study also identified those teaching skills that are generally lacking in each group. The study also attempted to rate trained and untrained primary school teachers as science teachers.

1.3. Background of the Problem

The presence of large numbers of professionally unqualified teachers in Kenyan schools has produced a free-for-all debate where many people have expressed their opinions.

This has been so because teaching is a profession and there is usually a tendency by professionals to protect the name of their profession. Professionals usually try to limit the number entering their professions because when this happens the position of members at the top are threatened. There is also a likelihood of the standards being lowered.

By having untrained people teaching in Kenyan schools are school pupils more likely to fail national examinations? In what way do UTs guarantee that they can do a good job?

Saadeh has this advice:

It is not enough for a professional to go into the emotions of his act without guaranteeing in some reasonable way that he is more able than non-trained⁷ people or amateurs to perform it

7 SAADEH, I.Q. (1970) "Teacher Effectiveness of classroom Efficiency: A new Direction in the Evaluation of Teaching"
The Journal of Teacher Education, Vol. XX1
No. 1 spr. 1970, p.75.

This implies that even trained persons that cannot guarantee through their performance that they are actually better than amateurs should not be allowed to practise.

When does a teacher become a professional? It's after he can guarantee that he can do a good job, may be after acquiring a certificate from a TTC.

All adults have in one way or another gone through the emotions of teaching their children, relatives or other subordinates. It would be wrong to call them teaching professionals. UTs are teaching under similar circumstances. UTs are not professionals as they have fallen short of the above condition.

In another aspect UTs meet an aspect of a professional in that a professional is somebody who performs through intellectual activity some critically important service to his society.

Without the UTs Kenya could not have managed to achieve seven years free primary education. These teachers are definitely doing an important service to the nation.

This has been recognized by the president when he said:

UTs will remain indispensable to the nation's primary education system so long as the school going population continues to increase⁸

8 MOI, D.T. "Untrained teachers have role to play"
Sunday Nation, 20th January, 1981, p.1. col.1

Many have proposed that UTs be replaced by trained teachers. The Minister for Basic Education once called for complete eradication of UTs from the educational system⁹, while the chairman of the Kenya National Union of Teachers (KNUT) had this opinion:

UTs especially in primary schools, cannot ensure children's equality in Education. There is need for "critical examination" of the quality of these teachers if they have to provide good education¹⁰

These opinions are not based on any research evidence. It is argued that since these people are untrained they are not providing 'good education' compared to their trained counterparts but there is need for evidence. Uneven distribution of UTs in the country has been claimed and blamed for causing poor examination results in some parts of the country. The Secretary General of KNUT had the following accusation for the Ministry of Higher Education:

It is not possible for only one area of the country to achieve better examination results than others while their teachers were trained in the same college..... Why has the Ministry of Education staffed some districts with all qualified teachers while in some the majority were untrained?¹¹

9 MAILA, H.N. "Train the Untrained Teachers" The Standard, 19th December, 1979, p. 9, Col. 1.

10 MULINDI, D. "Shorten Training Period" The Standard, 5th December, 1979, p. 9.

11 ADONGO, A.A. "I won't retract" says Adongo: Daily Nation, 26th April, 1982, p. 1, Col. 6.

During data collection I noticed some imbalance in the distribution of UTs. It is unknown whether schools with many UTs perform poorly in the certificate of primary education (CPE) examinations.

The UTs are not properly represented in the KNUT and so most of their problems may not be solved through this body. The Secretary General of KNUT once referred to them as outsiders and jobless:

KNUT will not allow outsiders to tamper with Union activities during its elections
....one must be a professionally qualified teacher who has worked for five years
....there are no vacancies for jobless people¹²

Though they are doing a very important job UTs claim they are not being remunerated fairly for their services but instead are being exploited. They claim that their complaints about salaries have always fallen into deaf ears. The following is a typical complaint they normally address to the press:

....It is unfortunate for these UTs because nobody has ever bothered to know why this inhuman action (exploitation) should happen to so many employees who are expected to do a very important job¹³

12 ADONGO, A.A. "Teachers Union Bars Outsiders"
Daily Nation, 28th July, 1980, p.5.
col.2.

13 Concerned Teacher, "Untrained Teachers being Exploited" Daily Nation, 17th July, 1979,
p.10. col.1.

Some people are dissatisfied with UTs and UTs are also dissatisfied with their terms of service. The result is that their morale is low and so they are likely to do little work since they are paid little money anyway. They feel that their salaries should be increased according to experience, but as professionals and as a policy, promotions cannot be based on experience alone. It must be objectively shown that it is possible to get effective teachers by letting untrained persons gain experience in the classroom.

At present only UTs are absorbed in TTCs. The intention is to train all the UTs. To be absorbed in a TTC one is required to have a certain academic qualification and must have taught as UT for at least one year. Holding academic qualification constant, it would mean that the longest serving UTs should be absorbed into TTCs. We still have many UTs with over ten years' experience. Some of these teachers have refused to join TTCs. They find it difficult to join any of the 18 TTCs because of the low allowance they are given at these colleges. The UTs, as every body else, take family responsibilities in accordance with African extended family system. The TTC allowances stand at Shs. 100 monthly but upto very recently it was only Shs. 20 a month. Some UTs cannot make ends meet if they join TTCs.

This is what one said:

....Most of us have families to take care of. Personally I do not feel like joining any of the 18 TTCs. It requires alot of courage to join a training college only to be paid an allowance of Shs.20 monthly. This money cannot maintain my family¹⁴

The above statement implies that some UTs intend to remain UTs forever. If we are to have only trained teachers in Kenya Schools such teachers will have their services terminated which will be worse for them and the families they are nursing.

As the school going population continues to grow Kenya may have to employ more UTs, and try to train them in residential colleges, but some of them will still remain in the classrooms.

14 ADHANJA, J.O. "Teachers are the Same"
Daily Nation, 27th August, 1981, p.7.
col.2.

1.4. Purpose and Importance of the Study

The purpose of this study is to compare the instructional behaviour of UTs with that of their trained counterparts with a view of finding out which group is relatively better than the other in those behavioural patterns that are associated with meaningful learning in pupils.

Differences are believed to exist but some claim there is no difference. Some UTs claim they just teach as trained teachers if not better. Here is a teacher's comment:

Infact the line dividing the UTs from the trained ones cannot be drawn in the classroom but sadly enough on the payroll¹⁵

UTs also claim that they are often overloaded with classwork. This study was to investigate whether the difference between UTs and trained teachers can be drawn in the classroom.

In some cases UTs have been boycotted by students in demand for better teachers and this has sometimes resulted in disturbances in the form of riots.¹⁶ Parents also blame any failures in CPE more on UTs than on trained teachers. Some doubt their validity as teachers and at times call them bogus teachers.

15 ADHANJA, J.O. "Teachers are same" Daily Nation, 27th August, 1981, p.7. col.2.

16 RATENG, L. "Students Recalled to School" Daily Nation, 15th July, 1981, p.9. col.3.

This is what one parent said about them:

These 'matatu'*teachers pick up their certificates from the bush, when they are given forms to fill for the colleges they refuse because most of them got their certificates through 'magendo'**. They know they are going to fail¹⁷.

It then appears that UTs are only interested in the money they get but not in the work they do. This can be so bad for it would appear necessary to sack all of them. It is incumbent upon them to show that they are also doing some good work so as to win the confidence of the public. There is also need to boost their morale through some incentive. It is through collection of data from their teaching that we may be able to pass rational judgement about them.

A study of this nature can show whether there are areas where something is urgently needed especially if there are skills that the UTs are lacking. Quick in-service training can be organized to focus on the missing skills.

* Practising in a field where the practitioner is not qualified but takes advantage of the situation due to thirst for money.

** a means of obtaining something illegally

17 AUTTAH, L. "Teachers Misuse Time"
Daily Nation, 18th January, 1980,
p.7. col.6.

The most objective way of finding out what is happening is to go where the action is - the classroom - and compare UTs treatment of subject matter and teaching methodology with that of the professionally trained teachers and also compare the teaching of both with what should happen in theory.

Interaction Analysis offers a quick and reliable means of gathering such information. It offers a means of getting into the classroom and getting first hand information.

Systematic observation presents us with what looks like a motion picture. A record of observation consists of a series of still pictures of behaviour which when put together produces a record of interaction of pupils and teachers.

An examination of a series of systematic observation helps to examine what is actually taking place in the classroom. Through such examination it is possible to judge the teacher whose class is likely to promote more meaningful learning by basing our reasoning on the present theories of learning.

Interaction Analysis Observation System developed by Flanders (1970) is a tool for classroom observation and like any other tool, it is not perfect and its ability to do good depends on the command the user has on it.

1.5. Some Questions to be Answered

1. Are there any instructional behaviour differences between trained and untrained teachers?
2. Which teachers, trained or untrained, have instructional behaviour more favourable to meaningful learning?
3. Can we identify certain instructional behaviour that are generally lacked by trained teachers?
4. Can we identify instructional behaviour that are generally lacked by untrained teachers?
5. Which teachers, trained or untrained, are more flexible in their use of more teaching skills?
6. Which group, trained or untrained, displays teaching patterns most likely to promote creativity in their pupils?
7. Which teachers concentrate more on content rather than the other aspects of teaching?
8. In classes of which teachers is the exchange between teachers and pupils more rapid?
10. Is instructional behaviour of teachers affected by their professional qualifications?
11. Which group, trained or untrained, tolerates more silence or confusion in their classes?
12. Is age a factor in the classroom behaviour of teachers?

13. Is past experience a predictor of teaching effectiveness?

1.6. Assumptions of the Study

This study proceeds on the assumption that a teacher's instructional behaviour influences and determines the behaviour of pupils; that the teacher is responsible for the interaction patterns in the class since he plays the active role most of the time while the pupils most of the time play a reactive role.

Teaching is assumed here to be a series of systematic actions intended to induce learning.

It is also assumed that:

- (a) Teaching is an activity that can be described and analyzed.
- (b) The teacher is a professional capable of making humane and creative decisions regarding the teaching act.
- (c) Student learning can be measured only through observation that reveals changes in behaviour.
- (c) The act of teaching is a complex process that is influenced by a field of forces of which teachers can only be in part aware.
- (e) By observing and analyzing teaching, rational judgements can be made about the effectiveness of the teacher on the basis of theories of learning.

1.7. Statement of Hypothesis

The independent variables in this study is training and no-training. It is hypothesised that because of training differences exist between trained and untrained teachers; that certain types of interaction, facilitated by training, are more favourable to learning in classrooms.

1.7.1. Main Hypothesis

Trained teachers are significantly different from untrained teachers in their classroom interactions that are more favourable to learning.

1.7.2. Sub-Hypothesis

- (i) Trained teachers talk less than untrained teachers in their classes.
- (ii) Pupils in classes of trained teachers talk more than those in classes of untrained teachers.
- (iii) Trained teachers have more periods of silence or confusion than untrained teachers.
- (iv) Trained teachers respond more to pupil-talk than untrained teachers.
- (V) Trained teachers have greater tendency than untrained teachers to use questions that guide content oriented part of classroom discussion.
- (Vi) More pupils in classes of trained teachers take part in the initiation act than those in classes of untrained teachers.

- (vii) Trained teachers take less active role in classroom discussion than untrained teachers.
- (viii) Trained teachers are more flexible than untrained teachers.
- (ix) Professional qualification does not affect classroom behaviour of trained teachers.
- (x) Age of the teacher is not a factor in the classroom behaviour of teachers.
- (xi) Experience of the teacher is not a factor in the classroom behaviour of teachers.

To test these hypotheses the variables¹⁸ in Table 1 are employed.

18 FLANDERS, N.A. "Analysing Teacher's Behaviour"
Addison-Wesley Publishing Company,
p.106.

Table 1: Dependent Variables

Interaction Variable	Symbol	Norm*
Percent Teacher Talk	TT	+
Percent Pupil Talk	PT	+
Percent Silence or Confusion	SC	+
Teacher Response Ratio	TRR	42
Teacher Question Ratio	TQR	26
Teacher Immediate Response Ratio	TRR89	60
Teacher Immediate Question Ratio	TRQ89	44
Pupil Initiation Ratio	PIR	34
Content Emphasis	CCR	55
Total Sustained Discourse	SSR	50
Pupil Sustained Discourse	PSSR	35 or 40
Flexibility Ratio	FR	+

1.8.0. Definition of Terms

Interaction analysis is a system for observing and coding the verbal interchange between a teacher and his pupils. The reader is referred to appendix 1 and 11 for familiarization with the categories and cells which are used in the following definitions.

*The average normally expected of an average teacher.

+ Variable

Because of problems already experienced with the use of I/D ratios, Flanders (1970) p.102, this study uses the following concepts:

- (i) Percent Teacher Talk (TT): Percentage of classroom time the teacher spends talking. It is calculated by adding frequencies of categories 1,2,3,4,5,6, and 7, multiplying the sum by 100 and dividing the product by the sum in categories 8 and 9.
- (ii) Percent Pupil Talk (PT): Percentage of classroom time spent by pupils talking. It is calculated by adding frequencies of categories 8 and 9, multiplying the sum by 100 and dividing the product by sum of frequencies in categories 1,2,3,4,5,6, and 7.
- (iii) Silence or Confusion (SC): Percentage of class time spent during silence or confusion. It is calculated by multiplying frequencies in category 10 by 100 and dividing the product by sum of frequencies in categories 1 and 9.
- (iv) Teacher Response Ratio (TRR): Defined as an index which corresponds to the teachers' tendency to react to the ideas and feelings of pupils. It is a percent figure. TRR is calculated by adding category frequencies 1+2+3, multiplying by 100, and dividing the sum by frequencies 1+2+3+6+7.

- (v) Teacher Question Ratio (TQR): Defined as an index representing the tendency for a teacher to use questions which guide the more content oriented part of the class discussion. It is calculated by multiplying the category 4 frequencies by 100 and dividing by the total of categories 4 and 5.
- (vi) Instantaneous Teacher Response Ratio (TRR89): The tendency of a teacher to praise or integrate pupils' ideas and feelings into the class discussion at the moment pupils stop talking. The TRR89 can be calculated by adding the cell frequencies in rows 8 and 9, columns 1,2 and 3, multiplying this sum by 100, and dividing the product by the total tallies in the cells of rows 8 and 9, columns 1,2,3,6 and 7.
- (vii) Instantaneous Teacher Question Ratio (TQR89): The tendency of the teacher to respond to pupils' talk with questions based on his own ideas, compared to his tendency to lecture. TQR89 is calculated by adding the frequencies in cell (8-4) + (9-4), multiplying by 100 and dividing by the total tallies in the four cells (8-4) + (8-5) + (9-4) + (9-5).

- (viii) Pupil Initiation Ratio (PIR): Indicates what proportion of pupil talk was judged by observer to be an act of initiation. It is calculated by multiplying the frequency in category 9 by 100 and dividing by all pupil talk.
- (ix) Content Cross Ratio (CCR): Isolates those teacher statements which are least likely to be involved with certain process problems which every teacher must solve. High CCR indicates less attention to categories 1,2,3,6. It is calculated by finding percent of all tallies that lie within columns and rows of categories 4 and 5.
- (x) Steady State Ratio (SSR): Reflects the tendency of a teacher and pupils to remain in the same category for periods of more than 3 seconds. The higher the ratio the less rapid the interchange. It is determined by calculating the percent of all tallies that lie within the 10 steady state cells.
- (xi) Pupil Steady State Ratio (PSSR): Is more sensitive to the rapidity of the interchange when pupil-talk is average. It is calculated by adding the frequencies in the cells (8-8) + (9-9), multiplying by 100 and dividing by all pupil-talk tallies.

(xii) Flexibility Ratio (FR): Defined as number of cells occupied divided by total number of cells in Flanders matrix. Indicates the ability of the teacher to integrate the ten categories.

Trained Teacher: A person who has successfully completed a course of teacher education at a recognized Teacher Training College.

Untrained Teacher: A person who has not undergone any course in teacher training.

Teacher Training: All the formal and informal activities and experiences that help to qualify a person to assume the responsibilities of a member of the educational profession and to discharge his responsibility more affectively.

1.9.0. Delimitations of the Study

- (a) This study is limited to science teachers in primary schools with an experience of less than four years.
- (b) The study involved science teaching in standards 6 and 7. This was because the tool for collecting data is concerned with verbal expression. Pupils in these classes are able to express their opinions or ideas clearly than those in lower classes.
- (c) Because of difficulty in finding female science teachers in upper primary science classes, this study limited itself only to male science teachers.
- (d) The study reported herein is neither evaluative nor a study of teacher effectiveness since no attempt is made to determine the effects of teaching behaviour upon pupils. Furthermore, no attempt is made to establish among variables nor to search for causes of teacher behaviour. This study is an analytic and descriptive one in the natural history sense.

1.10. Remainder of the Thesis

The next chapter is chapter 2 which reviews the literature related to this study. Chapter 3 describes methodology employed while Chapter 4 is that of analysis and findings, Chapter 5 has summary, conclusions and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

The Kenyan classrooms have not been sufficiently researched. The little that has been done is hard to locate. In a seminar paper G.S. Eshiwani¹ has noted that one of the most disturbing issues in educational research in Kenya is lack of documented information concerning research which has been undertaken.

This review examines the available publications and findings on classroom instruction, teacher training, learning and interaction analysis and Science Education in Kenya and elsewhere that the reviewer is aware of.

The studies reviewed here are intended to constitute experiences which provide insight on the Kenyan situation.

2.1. Kenya's Education System:

Kenya has seven-year primary education system at the end of which pupils sit Certificate of Primary Education (CPE). Some successful candidates get admission

1 ESHIWANI G.S. (1980) "Recent Educational Research in Kenya. A research Paper presented to the Seminar on Education Research and Development" Bureau of Educational Research, Kenyatta University College.

into four-year Secondary Education whose end is marked by Kenya National Certificate of Examination, (KNCE)* known as the 'O' level.

After two years secondary education candidates who wish sit Kenya Junior Secondary Examination (KJSE). KNCE candidates are graded in divisions I, II, III, and IV; worse than division IV fail. Successful 'O' level candidates proceed to two-year Higher School Education for the Kenya National Advanced Certificate of Education (KNCE) normally called 'A' level. Some of those who meet the requirements for university admission are admitted to the University of Nairobi, and depending on the number of places available others who meet the requirements but are not admitted can find places in foreign universities.

The present requirements for entrance into two-year teacher training in the primary TTCs are holders of KNCE divisions I, II, or III or KNACE plus at least one-year teaching experience as a UT. Holders of these certificates are taught for two years in some classes and at the end write examinations set by Kenya Examination Board (KNER).

* Formally EACE

Grading is based on performance regardless of previous educational qualifications. They become P1, P2 and P3** with P1 being the highest. Those who fail to attain any of these grades are called unqualified teachers (UQ) and serve in similar terms to those untrained. There occur cases where 'A' level candidates become P3s while 'O' level division III candidates become P1s.

** A grade P4 has been discarded.

2.2. . Summary of Findings

Sifuna² reported a study on the quality of teaching in Kenya primary schools which revealed, among other things, that Kenyan primary school teachers encouraged rote memorization of facts as opposed to active participation on the part of pupils. His study reported a teacher's academic qualifications to be positively related to his quality of classroom interaction with pupils, with PIs 4% better than P4s. He also found sex of the teacher to be related to the quality of classroom interaction in favour of female teachers and recommended that more female teachers should be employed, especially for lower primary classes.

Good and Sikes³ in a study of "Effects of Teacher Sex and Student Sex on classroom interaction" reported some findings that contradict those of Sifuna. They reported that sex of the teacher or that of the pupil does not significantly affect the quality or quantity of classroom interaction. Sifuna derived some of his conclusions from calculations of percentages and did not show whether the differences he found were significant. Good and Sikes⁴ also investigated whether subject matter being taught by a teacher had

2 SIFUNA, D.N. "The Impact of the 'NPA' on the Quality of Teaching in the Primary School of Kenya" .A. Thesis submitted to the University of Nairobi, p. 371.

3 GOOD, T.L. & SIKES, J.N. "Effects of Teacher Sex and Student Sex on Classroom Interaction" Journal of Education Psychology 1973, Vol. 65, No. 1, pp. 74 - 89.

4 Ibid.

effect on classroom interaction. They found strong subject matter differences in quality and quantity of interaction indicating that social studies were generally related and discussion oriented in comparison to Mathematics classes which tended to be more focused on the learning of subject content.

In a study of teacher questioning behaviour, Arnold⁵ found pause behaviour between teacher-student exchanges averaged two seconds. He found that questions of a specific level elicited responses of a similar nature. An important aspect of classroom interaction is silence in the classes because it is during these periods that transitions in classroom dominations usually occur. In a study which involved silence as a variable, Anderson⁶ found that this factor related to all achievement and creative variables. He used Flanders' interaction system for his observations. Anderson concluded that the use of ideas initiated by pupils, teacher initiated talk* and the use of silence and seat-work facilitated both academic and creative performance.

5 ARNOLD, D.S. et al "An Investigation of Relationships Among Question Level, Response Level and Lapse Time" School Science and Mathematics, Vol. 73, No. 7, pp. 591 - 594, October, 1973.

6 ANDERSON, J.R. "Classroom Interaction, Academic Achievement and Creative Performance in Sixth Grade Classroom" Dissertation Abstracts, Vol. 73, No. 7, p. 185A, 1973.

* See Appendix 1.

Sister Chasas⁷ examined the relationship between teacher-student verbal interaction and critical thinking abilities using Flanders' observation system. The types of interaction included lecture, discussion with broad questions, and discussion with narrow questions. Results revealed discussion with broad based questions to be slightly higher than the other methods. Lecture produced greater achievement than discussion with narrow questions.

In studies on classroom observation, an observer normally sits in the classroom together with the teacher and pupils. Some critics⁸ have claimed that the presence of observers in the classroom may affect the procedures that normally go on in these classrooms and that a teacher may act rather than teach as he normally does.

7 CHASAS Sr. V.M. "Teacher-Student Verbal Interaction and Critical Thinking Ability" Dissertation Abstracts, Vol. 34:2, (1973), p. 660A

8 WALKER AND ADELMAN "Interaction Analysis in Informal Classrooms; Critical comment on the Flanders' System. British Journal of Educational Psychology. Vol. 45, (1975), pp. 73 - 76.

Samp⁹ studied observer effects on Teacher verbal Classroom Behaviour and found that a teacher's verbal behaviour varies as a function of the observer's presence or absence in the classroom setting and information about forthcoming observations do not influence the verbal behaviour of teachers.

Samp emphasized that direct observation is probably one of the most realistic procedures for noting and analyzing what occurs. However, Medley and Mitzel¹⁰ cautions that whatever can be done to minimize the disturbing effects of the observer should be done.

The quality and quantity of interaction is likely to vary with the number of pupils a teacher has in class. The quality of interaction is expected to decrease as the number of pupils in class increases. Hakemulder reported a project on Primary Teacher training in Kenya which found Kenyan classroom to be crowded and warned that:

From psychological and educational point of view this is not good for the quality of education, especially the lowest standards of primary education usually crowded with 60 or more children.

9 SAMP, T. "Observer Effects on Teacher Verbal Behaviour", Journal of Educational Psychology, Vol. 68:6 (1976), pp. 736 - 741.

10 GAGE, N.L. (Ed) Handbook of Research in Teaching by MEDLEY and MITZEL "Measuring Classroom Behaviour by systematic Observation", Chicago: Rand McNally, (1963), p.306.

Education of reasonable standard is under these circumstances very difficult to achieve¹¹.

2.2.1. Untrained Teachers' Problem

At the end of 1981 Kenya had some 15,926 untrained teachers and 41,505 trained teachers¹². Addressing a conference of the Association for Teacher Education in Africa (ATEA), the commissioner for Education, Western State of Nigeria, told the conference that:

If a teacher is to be in a position to discharge his responsibility properly he must be trained, for the blind cannot lead the blind or else the two of them will fall headlong into the ditch and great shall be the fall¹³

In the same year, Hakemulder¹⁴ identified the following as factors that seriously weaken the quality of education in Kenyan Primary Schools;

- (a) the large number of UTs,
- (b) poor school buildings,
- (c) the large number of pupils in classes

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- 11 HAKEMULDER, J.R. "UNESCO - UNICEF Project on Primary Teacher Training in Kenya, 1973. ISS/ECA Symposium of Educational Innovation in East Africa, Africa Hall, Addis-Ababa September, 1973, p.4.
- 12 WAGARA, J.K. "Yesterday in Parliament" Daily Nation, July 23rd, 1981. p.5, Col. 1.
- 13 FAFUNWA, A.B. (Ed) "ATEA Conference 1973" in AJAYI, O., Welcome Address. p. XVI
- 14 HAKEMULDER, Op. Cit. p.3.

(d) an urgent need for educational equipment.

The country's gravest question is how the teacher problem can be solved. Some suggestions have been put forward.

The NCEOP report¹⁵ of 1978 stated that the large force of UTs must either be trained or phased out. It reported that UTs are not training in teaching methodology and have been found to be lacking in content. It recommended that a solution may be found if the period of teacher training is reduced to one year.

Hakemulder¹⁶ recommended that the classroom performance of UTs be improved while they are at work by observing their teaching methods, noting their weaknesses and demonstrating improved methodology. This suggestion would be a good idea especially if all teachers were trained in classroom observation as it would then be possible for a teacher to observe a colleague's lesson and later discuss the outcome with the observed teacher.

15 KENYA, "NCEOP report, 1978", p. 109

16 HAKEMULDER, Op. Cit., p. 10.

Presently Kenya lacks manpower trained in classroom observation that can effectively observe lessons and give valuable comments on teachers' weaknesses.

Ayot¹⁷ conducted a study on In-service Teacher training in Kenya and raised the concern in the country that the present primary education is not relevant to the country's needs. The study offered the following recommendations to solve the country's teacher problem:

- (a) UTs without College (TTC) entrance requirement should be given a minimum period to sit for KCE and those who fail to acquire such qualification should be terminated from teaching service.
- (b) UTS should be phased out of teaching service through in-service training activities, and
- (c) UTs who have served for a long time and cannot be terminated should be trained on the sandwich courses.

Hakemulder, however, reported that there appears little chance that the number of UTs in Kenya may be reduced by replacing them with any substantial number of trainees from TTCs.

17 AYOT, H.O. "A review of In-Service Teacher Training in Kenya" Vol. 1, p. 85, Kenvatta University College.

2.2.2. Educational Qualification and Period of Training

- (a) At ATEA Conference (1975) a Kenyan delegate¹⁸ proposed reduction of period of teacher training to one year as a way of solving the country's teacher problem. The NCEOP report recommended the same.
- (b) The policy has been to admit only UTs to TTCs. Nobody qualifies for admission into a TTC before serving as an untrained teacher.
- (c) The NCEOP report¹⁹ recommended that only those with KNCE division 111 or above should be admitted to TTCs.

a, b, and c above are areas where Kenya needs some experiences to learn.

Good educational qualification is very important for a job like teaching. Teaching should also absorb the best candidates. It should not be a profession for academic precipitates as the following statement allows:

Recruitments of UTs holding a certificate of the KJSE education or school certificate division 1V into TTCs have been stopped except for the 13 arid and semi-arid districts....²⁰

18 MUHORO, Op. Cit. "ATEA 1975", p. 35.

19 KENYA, "NCEOP report", p. 110.

20 OJIAMBO, J. "Untrained recruits left out"
Daily Nation, 10th Jun. 1982, p. 5, Col 6.

Asian Programme of Educational Innovation for Development (APEID)²¹ held a conference that got findings that Kenya may have something to learn. The conference found that majority of graduates from Teacher Education Institutes (TEI) in these Asian countries are rated low in competency and content due to poor academic backgrounds of student teachers combined with lack of opportunity for intensive training and teaching practice. It also blamed ineffective teaching practice supervision. The conference found that in Bangladesh the reservation of 75% of places available in TEI for UTs in the Education Service stands in the way of taking better qualified students and recommended that the reservation of 75% of the places for UTs should be done away with and candidates with better academic qualifications should get preference. This conference recommended training period to increase from 10 months to 2 years. For Pakistan period of training was necessary to be increased to three years from 1 year. A Malaysian delegate told the conference:

The present two year programme is too short for proper professional, academic and personal development.

21 APEID Sub-Regional Workshop "Continuing Education for Teacher Educators", 1979.

The Ministry is now considering increasing the period of training into three years²² with one full term of teaching practice²³

Kenyan planners have a lot to learn from the findings of the APEID countries, especially in areas like reserving 100% of places in TTCs for UTs in-service, absorbing UTs with very low academic qualifications into TTCs and the proposal of reducing period of training to one year because when all these are allowed Kenya may not produce successful teachers whom Gu-Ming-Yuan insists ought to have:

a relatively comprehensive and profound education, a knowledge of education theory, the ability to continuously absorb advanced scientific knowledge and pass it on to their pupils and develop their mental faculties²³

It needs more years in college to mould such teachers.

2.2.3. Learning and Interaction

The ultimate aim of teaching is learning. It is generally agreed that learning is a direct result of good teaching and effective teaching must produce observable changes in pupil behaviour.

22 APEID, Sub-Regional Workshop "Continuing Education for Teacher Educators," 1979.

23 GU-MING-YUAN "Teacher Training in China" Journal of Experimental Education Vol. 7:3 (October, 1981) p. 249.

Hugh²⁴ has defined teaching as behaving and that learning involves behaving. It follows therefore that behaviour which is characteristic of good teaching can be demonstrated by good or effective teachers. However, there is no way of identifying good teachers except through observation²⁵.

Pupil learning can be measured through observation that reveals changes in behaviour. Successful teachers that can facilitate more pupil learning will be those that use, a wide band of behaviour. However, Deighton (1966)²⁶ found that teachers seem to use a very narrow band of behaviour and not the wide spectrum which is theoretically available to them.

The degree of interaction between the teacher and his pupils are proportional to learning since these interactions are the forms of displayed changes of behaviour.

24 HOUGH, J.B. (1970) "Teaching: Description and Analysis" Addison-Wesley Pub. Company Reading, Massachusetts, p.6.

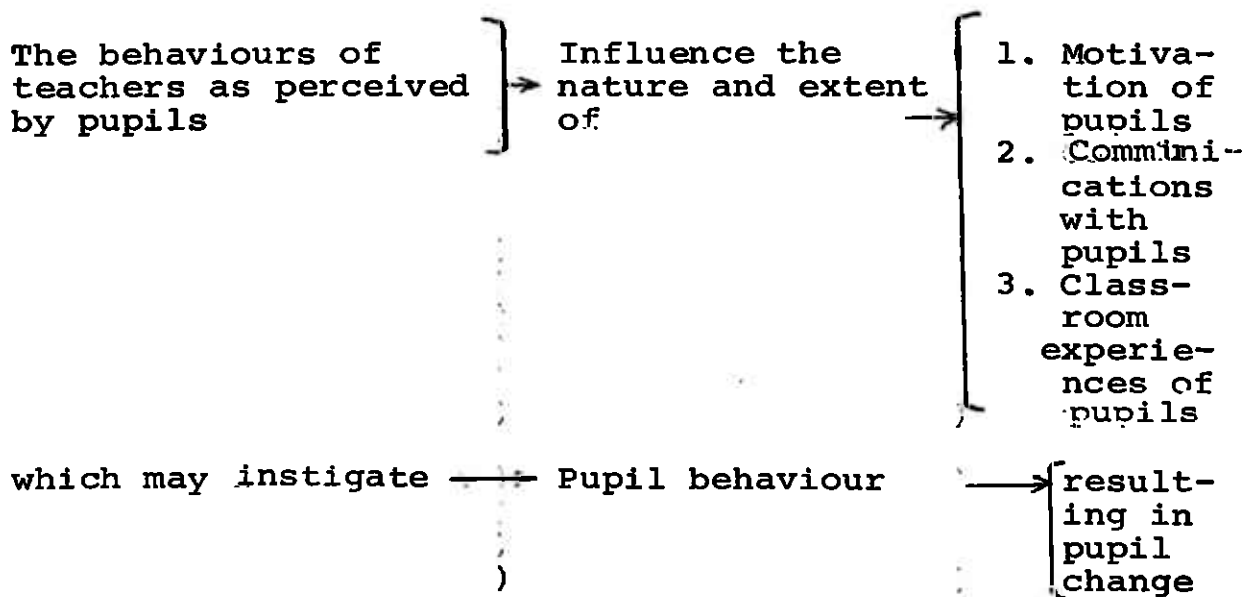
25 AYOT, H.O. "Approaches to School-Based In-Service for Effective Teaching" Vol.111, (1981) p. 7, Kenyatta University College.

26 DEIGHTON, L.C. (Ed) "The Encyclopedia of Education" Vol. 2, p. 177, Col. 1.

The so-called democratic class, where each member has equal chances of talking should facilitate more pupil learning. Rowe²⁷ has reported that different teaching techniques produce some specific pupil outcomes, for example warm supportive rewarding behaviour appear to help concept learning but also to reduce risk-taking. In Inquiry, effective teaching and therefore effective learning cannot be proven by the absence or presence of any instructional variable even those with high probabilities for effecting change, such as the teachers' provision of opportunities for learners to practise the desired behaviour, using reinforcers in accordance with a theory for shaping behaviour, presenting information in a logical sequence and supplying advance organizers.

The following model²⁸ can show how teacher behaviour influences pupil behaviour:

- 27 ROWE, M.B. "SCIENCE EDUCATION 1973"
University of Florida, An International
Publication 1973, p. 85.
- 28 AMIDON, J.E. and HOUGH, J.B. (Eds) "Inter-
action Analysis: Theory, Research and
Application"
Addison - Wesley Publishing Company
Inc., (1967), p. 70.



Deighton²⁹ has reported that evidences from several university projects seem to indicate that trained teachers are behaving more in congruence with their beliefs than ever before, that they seem better able to translate principles of learning into operational terms. He notes that trained teachers are beginning to develop their own theories of instruction, theories they are able to put into practice.

2.2.4 Science Education

When science educators argue that science should be taught by inquiry, they are advocating that pupils should learn to view science in a particular way, that they should see scientific findings as tentative,

29 DEIGHTON, L.C. Op. Cit. p. 177, Col. 1

flexible-not God given, but subject to revision and reformation³⁰.

By teaching science as an inquiry is an approach to teaching science which emphasizes the way in which science arrives at its findings rather than the findings themselves.

By the Discovery Method Science Educators refer to the way Science is taught rather than what is taught. These methods enable pupils to learn how to generate and test hypotheses.

This study assumes that the Kenyan pupils should be taught science by similar methods.

On the African context the reviewer has come across only a single conference on Science Education³¹. This conference found that the psychological needs of African Children required primary science courses to have more comprehensive aims than those limited to the learning of miscellany of scientific information generally delivered by lecturing. The conference accepted that in Science, Concept acquisition was a major aim; and where a vernacular language was the medium of instruction, the Curriculum should make provision for a standard scientific terminology.

30 MARTIN, M. "Concepts of Science Education: A philosophical Analysis "Boston University, 1972, p.7.

31 GILBERT, P.G.S. "Science Education in Africa: A report of the Sixth Leverholme Inter-University Conference in Africa, University of Malawi, pp. 223 - 232.

The conference recommended the establishment of science education centres, based in TTCs, to be recognized as growing points in science and responsible for pre-service and in-service training of teachers. Student teachers should be given frequent opportunities to observe and discuss classroom activities and to assist in the preparation of lessons and teaching aids.

Most Kenyan teachers use text-book centred methods. Taylor³² compared activity-centred teaching and text-book centred teaching and found activity centred teachers to be more self-sufficient, affected by feelings and suspicious than were text-book centred teachers. Rowe³³ found that teachers with favourable attitudes towards Inquiry teaching strategy tended to be older, females and use new Curriculum materials in the classroom.

32 TAYLOR, L.E. "Predicted Role of Prospective Activity - Centred Vs Text-book Elementary Science Teachers" Dissertation Abstracts, (1973), p. 3179A.

33 ROWE, M.D. Science Education 1973. University of Florida. An International Publication p. 46.

2.3. Summary of Literature Review

Kenyan primary education appears to be teacher dominated and pupils are normally passive listeners to the teacher. Subject matter and training of the teacher seem to affect the quality and quantity of interaction. There is no evidence that sex of the teacher determines the nature of his interaction with pupils.

Pausing rates or periods of silence of teachers appear to influence quality and quantity of pupil verbal output. Direct strategies help certain kinds of content acquisition such as basic scientific concepts.

There appears to be little observer effects and everything possible should be done to control these effects.

The Kenyan policy is to solve the teacher problem and intends to train or replace all untrained teachers. Asian countries have found one year teacher training to be inadequate and Kenya should consider this before reducing period of teacher training to one year. Better qualified candidates should be admitted to TTCs.

The Ultimate aim of teaching is learning. Teaching is behaviour and so is learning. Effective teaching and learning can be observed by analyzing teacher-pupil interactions. Effective teaching cannot be proved by presence or absence of any Instructional variable.

Teachers should develop in their pupils scientific attitude of viewing scientific findings as tentative and subject to revision. Teaching science should stress on the method of concept formation rather than the content.

CHAPTER THREE

METHODOLOGY

3.1. Description of Methodology

This study analyzes teachers' performance through interaction analysis using Flanders' Interaction Analysis Category System (FIAC) (Flanders 1970). Interaction analysis is a general term referring to any technique for studying the chain of classroom events in such a way that each event is taken into consideration. An observer has to sit in the classroom or views a video sound playback or just listens to voice recording and keeps a record of the flow of events on an observation sheet by use of symbols. The observer's speed depends on the category system, his skill and the difficulty of the interaction.

In teaching either the teacher is speaking or one or more pupils are speaking. This provides two kinds of transitions: first from teacher to pupil and second from pupil to teacher (See Appendix I).

The teacher can talk to initiate his ideas or to respond to his students. In the same way the pupils can talk to respond to the teacher or to initiate their ideas. To initiate is to lead, to create a first event which then must be dealt with. To respond is to deal with an existing event, to comply, to confirm, and in other ways to be influenced by the first event. Some events may be hard to code but these are negligible compared to the events that can be coded. These distinctions have a practical value in analyzing teacher and pupil communication.

FIAC has three categories for Teacher Talk in response to students, coded 1,2 and 3 and a category 4 for teacher questions. For teacher Initiation it has three categories 5,6 and 7. Pupil Talk is either in response to the teacher, coded 8 or initiation of his ideas coded 9. Finally there is category 10 for Silence or Confusion.

The ten categories in FIAC allow 90 possible transitions.

Fig. 1 presents a time-line graph which shows some possible transitions given all the possible events in FIAC.

It shows that at t_1 a teacher asks a question and at t_2 accepts a pupil's feeling to answer the question which the pupil answers using his original ideas at t_3 . At t_4 the pupil is praised by the teacher. At t_5 the teacher develops the lesson using ideas expressed by the pupil which he does until he slips into a lecture at t_6 . At t_7 the teacher criticizes the pupils which causes silence at t_8 and after this silence the teacher gives directions at t_9 which solicits response from pupils at t_{10} . Such transitions continue until the lesson ends*. A trained observer would record the

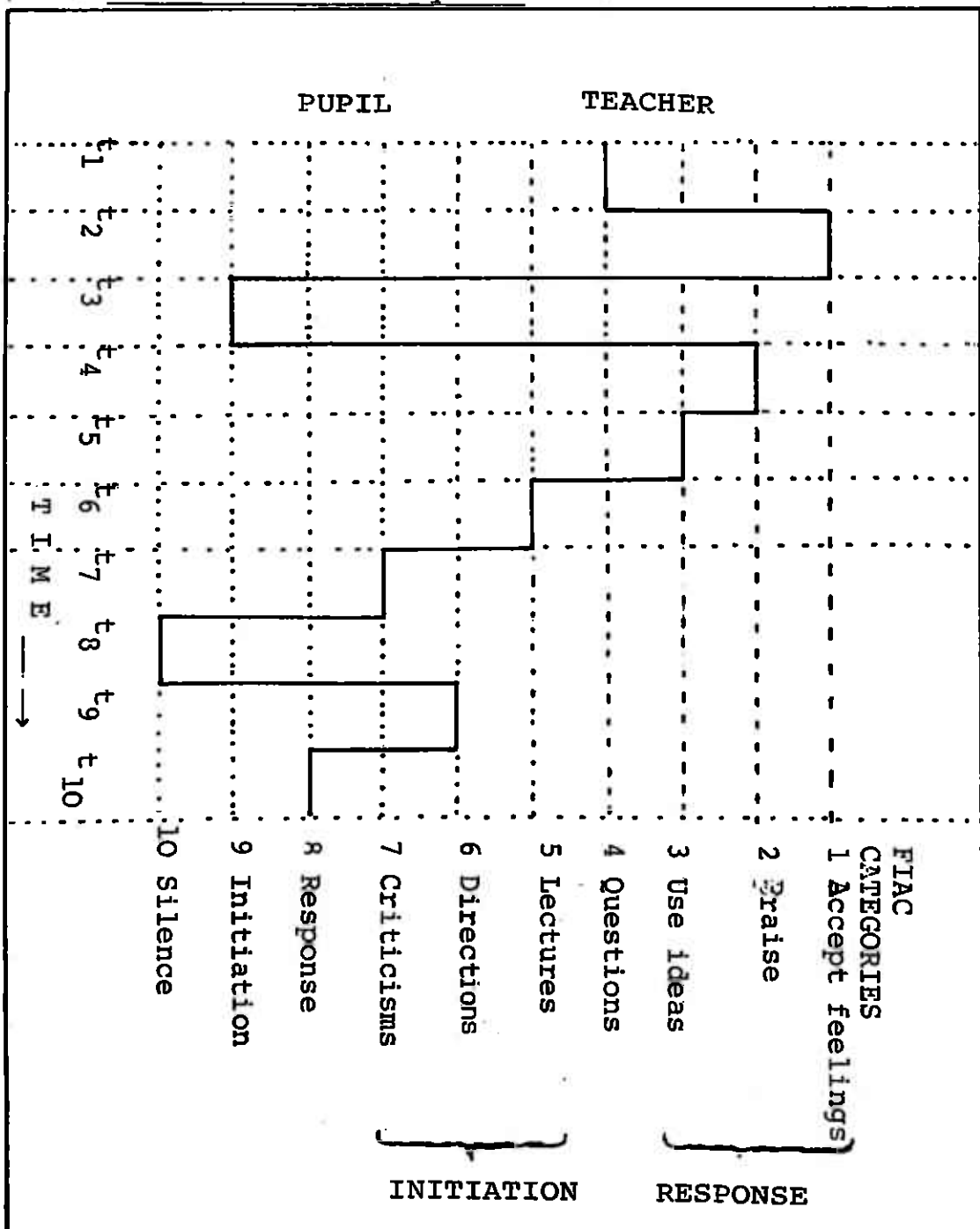
*

For further discussion refer:

FLANDERS, N.A. "Basic Teaching Skills Derived from
A model of speaking and listening"
Journal of Teacher Education spr. 1973
Vol.XXIV No.1 p.24

above episode using FIAC with the following symbols:
4,1,9,2,3,5,7,10,6,8,..... This is how pictures
of classroom events are recorded for analysis.

Fig. Time-line graph showing some possible tran-
sitions in FIAC system.



3.2 Selection of Subjects

Studies of the classroom needs very careful design. Because of the requirement that the observer of the classroom should understand everything going on in the classroom, knowledge of all possible languages that can be used and how they are used provide a firm basis for understanding interactions in the class. Knowledge of Culture, Slang and even Colloquial terms are important if the observer is to understand and record meaning of what is spoken and not merely hearing and recording.

The medium of instruction in primary school is still a mixture of English and local languages. It is important that classroom observer should understand both languages and how they are used.

Because of the above requirements, Siaya District in Nyanza Province was the most suitable place for the investigator to carry out the study.

The study was undertaken in a rural area because most teachers teach in rural areas, especially UTs. Primary Schools were appropriate choices because they are closer to each other compared to secondary schools. Again UTs in secondary schools are few and were unsuitable. Commuting between primary schools is easier than between secondary schools.

Selecting the subjects started by visiting the possible primary schools and selecting science teachers

in consultation with the head teacher and also by using the school monthly returns for details about teachers. Once a science teacher was identified as eligible to participate in the study, his service number, his professional qualification and his experience in the field since leaving TTC or since joining teaching as a UT from school were recorded. The process identified 120 possible participants. These teachers were required to teach science in classes they normally teach. They had to be normal science teachers in standards 5 and 6. They were only teachers of Pure Science and not Home Science. Though the topic is not a variable in this type of interaction analysis, efforts were made to have the teachers teach similar topics.

Time-table for the observation schedule was posted to the head-teachers at the end of 1981. This was taking into consideration of the means of transport which was a bicycle. There were schools which could be reached by nothing but a bicycle. A total of 34 primary schools participated.

3.3 Training for Classroom Observation

Training for observation started with learning the FIAC categories. After all the categories had been memorised, a training for recording speed followed and the aim was to achieve a speed of an observation every 3 seconds or between 20 to 25 observations per minute. It took about two months to achieve this.

Video recordings of micro-teaching in the Department of Communication and Technology supplied good material for training. Inter-observer reliability was first established by using materials from the video tapes. An inter-observer reliability of 0.46* was realised using video recordings. At this point training in live-recording started. A group from Kenya Institute of Education (KIE) came to Department of Communication and Technology to practise micro-teaching. This group gave the first opportunity to train in live recording and the investigator was given opportunity to criticize the lessons on the basis of his recordings. The investigator later carried out a small project similar to the study reported here. Further training in live-record-

* Estimates were made using Scotts method from:

FLANDERS, N.A in Amidon M.J "Interaction Analysis, Theory, Research and Application"
Addison Wesley Publishing Co. pp.161 - 166

ing was arranged at Kenyatta University College Primary School and later at Githurai Primary School towards the commencement of this study. A final inter-observer reliability of 0.89 was established.

3.4 Research Design

This study involved a matched sample of trained and untrained teachers. Efforts were made to also match the teachers and the study started with 45 teachers in each group. Each teacher was to be observed three times, each observation lasting 20 minutes. Observation was done using the observation sheet shown in Appendix II. There are 400 spaces in the observation sheet filled down the column, at an average of an observation every 3 seconds. Each sheet takes care of one observation.

Teachers were not given specific appointments. Each teacher was assigned a day of the week when he could be observed. For example, a teacher could know that he can be observed on any Monday at 10,00 a.m. but this could not let the teacher expect the investigator on all Mondays because the investigator had four alternative teachers to observe at the same time. This was to reduce special preparations on the part of the teacher. Teachers were not told the aim of the observation because the intention in this study was to

observe the teaching situation as it normally happens. They were told that it was just observation for its own sake; that the investigator was a university student observing science lessons merely due to his interest in the teaching of science; that the observation was not for administrative purposes at all. This convinced them because somebody coming for administrative purpose cannot travel by bicycle.

Subjects were not expected to make any special preparations. They were asked to teach exactly as they normally do and that there was nothing serious.

3.5 Data Collection and Recording

On arriving at the school the investigator used to stay in the staff room before being taken by the head-teacher or the teacher to be observed in the classroom. To reduce pupil curiosity, the investigator was first introduced to the whole school on the first visit and told the school that the gentleman is preparing to teach science as their teachers do and will sit in classes where science is taught to observe how it is taught.

The investigator sat behind the classroom before the lesson began and the teacher told pupils to pay attention only to him and not the visitor. Then the lesson would begin and recording started. Earlier

particulars required on observation sheet (See Appendix IV) were recorded. Teachers code number indicated whether the teacher was trained or untrained, TSC number, school and experience. The observation sheet was filled in about 20 minutes. The first square of observation sheet had 10 meaning the observation starts from silence or confusion. The episode illustrated in section 3.1. figure 1 could be entered as shown on the observation sheet. There were times when no observation could be entered due to a weakness in FIAC system. When there is communication breakdown or when interaction between the teacher and pupils stops, one cannot continuously keep on writing 10s because this will not represent what is really happening.

There can also be situations when pupils are busy doing experiments or some classwork and it is wrong to code these continuously with 10s and then wait for interactions to begin.

In the observation sheet, Appendix 11, the reader will find two 10s after an 8 indicating that the recording was stopped due to a break in communication.

Because of the necessity to record observations quickly it was hard to write 10 quickly and so a code of 0 replaced 10.

Data from observation sheet were tabulated into Flanders' matrix (See Appendix 111). Each teacher had

a matrix. Flanders matrix has 10 rows and 10 columns useful for arrangement of the 100 pairs which FIAC system produces. Each column and each row corresponds to one of the 10 categories. There are 100 cells formed by the rows and columns and each has its name, or address. Cell (1-1) is the intersection of row 1 and column 1. Data from observation sheet are entered into the matrix by considering them in pairs. A tally mark is used to record each entry. The episode illustrated in section 3.1 fig.1 has been entered in Appendix III matrix to serve as an example. Completed matrix for each teacher is used for calculations for variables using definitions given in Section 1.8.0.

All the trained teachers had their results condensed into one giant matrix representing all the teachers. The same was done for UTs. Tables 2 and 3-scores of Trained and Untrained teachers respectively on each of the variables. Figures 2 and 3 present cumulative matrices for TTs and UTs respectively. They were prepared by adding cell frequencies or loadings from each teacher's matrix.

TABLE 2 : SCORES OF TRAINED TEACHERS

TT. No	FR	SC	TRR	TRR89	TQR	TQR89	PIR	SSR	PSSR	CCR	TT	PT	GRD	PEXP	AGE
1	0.7	7	53	89	27	55	15	46	13	79	76	17	P1	1	27
2	0.7	11	86	85	25	56	6	44	8	76	74	16	P2	1	25
3	0.7	9	33	65	14	18	2	58	26	77	81	11	P1	1	22
4	0.5	4	69	87	20	13	0	55	6	87	82	14	P2	2	22
5	0.7	11	60	85	25	75	25	46	22	74	71	19	P1	1	24
6	0.6	11	39	69	32	58	1	38	3	74	74	16	P1	2	31
7	0.8	8	52	81	27	57	10	39	21	74	73	20	P2	2	28
8	0.5	5	40	84	12	41	2	56	8	91	80	15	P2	1	24
9	0.7	11	29	77	32	74	25	38	21	74	68	22	P1	2	25
10	0.5	7	27	76	14	47	5	53	8	79	78	15	P1	3	28
11	0.4	5	16	67	20	29	1	49	1	83	80	15	P1	2	33
12	0.7	9	19	49	13	55	22	27	27	69	80	12	P1	3	23
13	0.7	7	45	65	17	35	31	60	5	88	87	7	P1	3	24
14	0.7	11	55	79	24	78	32	54	26	80	78	12	P1	4	25

TABLE 2. Cont.

TT. No.	FR	SC	TRR	TRR89	TQR	TQR89	PIR	SSR	PSSR	CCR	TT	PT	GRD	PEXP	AGE
15	0.6	6	46	70	15	47	3	62	18	85	85	10	P2	4	31
16	0.6	7	68	86	32	73	2	37	18	68	70	23	P1	5	29
17	0.7	6	60	83	46	59	10	29	9	75	73	22	P2	4	25
18	0.8	19	28	51	11	60	54	53	29	75	76	8	P2	6	44
19	0.7	3	62	89	29	64	8	46	12	84	78	17	P2	4	29
20	0.6	16	73	74	28	64	10	45	18	74	72	15	P2	2	24
21	0.5	4	46	77	12	31	4	68	0	94	89	7	P2	8	29
22	0.7	5	42	87	33	66	6	33	7	78	70	25	P1	9	36
23	0.6	8	20	56	26	36	7	35	3	72	77	16	P2	2	31
24	0.5	9	87	95	41	74	21	35	12	76	68	24	P1	5	33
25	0.6	9	24	62	14	73	1	58	12	82	81	11	P1	2	29
26	0.6	6	73	92	16	51	12	66	11	91	86	8	P1	5	29
27	0.7	12	26	65	23	51	9	43	8	77	75	14	P2	6	31

TT. No.	FR	SC	TRR	TRR89	TQR	TQR89	PIR	SSR	PSSR	CCR	TT	PT	GRD	PEXP	AGE
28	0.6	14	43	75	31	54	8	43	16	78	73	15	P2	5	24
29	0.7	15	23	60	23	51	13	43	19	71	72	15	P1	5	29
30	0.8	9	29	71	39	63	6	33	34	56	64	28	P1	7	30
31	0.8	11	40	72	40	74	15	31	9	73	70	20	P2	2	33
32	0.6	6	86	93	63	86	15	34	20	75	70	25	P1	3	27
33	0.6	4	57	81	9	36	3	74	18	91	88	8	P2	5	28
34	0.6	5	50	76	24	55	10	26	4	85	81	14	P1	4	26
35	0.7	6	34	76	17	40	7	45	11	74	76	19	P2	6	33
36	0.4	9	12	78	30	41	3	36	5	75	73	19	P1	6	28
37	0.7	4	28	57	30	46	12	43	8	68	81	15	P1	1	28
38	0.4	3	18	68	8	23	5	69	3	88	88	9	P1	2	31
39	0.7	7	64	82	26	70	8	49	7	83	80	13	P2	2	34
40	0.5	6	49	69	17	69	9	57	22	75	83	12	P2	7	35

TABLE 3: SCORES OF UTs

	FR	SC	TRR	TRR89	TQR	TQR89	PIR	SSR	PSSR	CCR	TT	PT	PEXP	AGE
1	0.4	7	57	86	7	66	4	82	12	94	90	3	2	27
2	0.7	2	56	89	17	52	16	53	12	82	79	19	1	28
3	0.4	5	26	58	7	27	0	77	4	95	92	3	1	23
4	0.7	7	39	62	18	57	14	60	16	83	84	9	2	23
5	0.6	7	44	78	20	40	3	49	33	79	79	15	2	23
6	0.5	5	32	94	18	62	5	59	22	90	82	13	2	22
7	0.4	3	24	65	5	28	5	81	3	94	93	5	1	28
8	0.4	7	39	83	11	26	0	63	8	89	83	10	2	23
9	0.6	5	76	88	17	36	17	63	15	87	84	10	2	31
10	0.6	8	66	87	17	25	9	57	14	84	81	11	1	23
11	0.6	13	25	60	28	48	2	38	7	73	71	15	1	20
12	0.7	12	32	59	28	51	10	43	4	76	77	12	1	22
13	0.6	7	48	85	21	35	5	47	10	78	75	19	1	24
14	0.5	6	69	87	44	56	0	31	19	67	68	26	1	19

TT. No.	FR	SC	TRR	TRR89	TQR	TQR89	PIR	SSR	PSSR	CCR	TT	PT	PEXP	AGE
15	0.5	4	43	82	12	50	0	64	9	88	84	12	1	21
16	0.7	6	47	81	27	72	8	47	7	81	80	15	1	20
17	0.5	5	55	92	23	60	1	48	5	86	77	18	1	19
18	0.8	10	55	74	26	33	15	44	9	75	77	14	2	24
19	0.6	19	32	57	27	53	3	48	5	82	77	7	4	26
20	0.6	3	56	89	22	50	7	54	17	92	81	16	1	24
21	0.5	4	41	82	24	63	1	52	6	90	81	15	2	24
22	0.4	17	25	63	22	45	0	52	5	87	77	8	4	26
23	0.6	9	58	85	10	42	30	73	6	91	87	6	1	24
24	0.5	8	49	73	13	53	4	67	8	88	85	7	2	23
25	0.5	6	55	59	11	30	10	72	9	92	87	7	2	28
26	0.6	8	50	82	12	46	6	63	13	84	82	11	2	29
27	0.7	5	42	88	28	67	7	42	9	79	74	21	6	28

TT.No.	FR	SC	TRR	TRR89	TQR	TQR89	PIR	SSR	PSSR	CCR	TT	PT	PEXP	AGE
28	0.7	10	37	82	34	54	8	40	6	71	69	22	11	31
29	0.6	5	57	84	18	29	9	59	14	84	83	13	5	27
30	0.5	13	35	61	17	54	3	53	11	79	79	10	5	29
31	0.5	7	26	80	16	33	5	42	7	71	73	20	4	29
32	0.6	4	65	87	28	48	7	55	13	88	83	14	4	25
33	0.5	3	34	69	12	26	4	60	6	81	85	12	7	32
34	0.5	3	66	86	10	41	3	71	8	91	89	8	8	31
35	0.5	2	56	88	5	8	10	71	6	93	89	11	6	30
36	0.7	12	60	86	20	57	12	50	20	79	75	14	7	29
37	0.5	5	70	91	26	58	2	47	3	84	79	17	4	26
38	0.7	6	43	83	19	59	10	53	8	87	79	15	7	28
39	0.6	7	36	73	21	59	1	45	33	82	75	19	2	28
40	0.6	8	50	79	16	44	3	58	11	83	79	13	4	31

FIG 2: CUMULATIVE MATRIX FOR TRAINED TEACHERS

Cat.	1	2	3	4	5	6	7	8	9	10	TOTAL	%
1	4	18	6	40	43	21	1	27	12	6	178	0.47
2	17	33	72	159	162	42	19	235	38	100	877	2.29
3	5	22	390	351	303	38	8	48	9	48	1222	3.19
4	12	53	21	790	454	148	142	2585	193	945	5343	13.97
5	25	54	65	1656	15711	610	144	225	28	489	19015	49.71
6	10	4	4	130	291	299	65	959	39	272	2073	5.42
7	4	18	5	173	206	141	168	145	19	125	1004	2.62
8	57	495	524	1325	1096	498	278	632	48	227	5174	13.53
9	7	76	129	106	33	19	34	9	151	25	589	1.54
10	35	90	19	598	719	255	165	299	49	550	2779	7.26
TOTAL											38254	100.00

Cat	1	2	3	4	5	6	7	8	9	10	TOTAL	%
1	3	6	5	20	27	6	0	18	9	3	97	0.24
2	2	18	36	114	146	28	14	260	33	72	723	1.78
3	3	32	388	290	316	25	6	58	8	40	1166	2.90
4	10	65	14	775	383	123	92	2385	117	979	4943	12.22
5	22	35	73	1711	20132	538	81	390	6	471	23459	57.98
6	6	11	4	91	189	205	29	916	16	165	1632	4.03
7	2	12	7	106	145	67	84	126	11	59	619	1.53
8	25	416	575	1156	1290	461	244	472	30	217	4886	12.08
9	8	57	82	66	18	7	14	4	75	17	346	0.86
10	14	82	23	619	816	192	76	237	37	483	2579	6.37
TOTAL											40459	99.99

After the end of data collection it was found to be important to know the ages of all participating teachers. It was also discovered that there was some inconsistency in data collected on past experience. It was found to be easier and more reliable to get these data from files kept at the TSC headquarters because correct TSC number of each teacher was available. A letter of introduction was collected from Registrar's Office which enabled me to get permission to get to each teacher's file. The files gave very reliable information. Age and Experience are included in Tables 2 and 3. It will be noticed that the sample used in the final analysis has 40 TTs and 40 UTs. Others were dropped out.

Methodological Limitations:

The method of direct observation used here has a limitation in the sense that the observer in the classroom brings with him a new element of a variable and temporary membership into the classroom group which alters, to a degree, the behaviour pattern of the group. Some researchers have found the alterations to be insignificant (See Chapter 2).

Unconsidered factors such as class-size, groupings, age of pupils, sex of pupils, and setting variables, e.g. nature of classroom, teaching

materials, seating arrangement, time of observation, personality traits, etc. could fall here.

CHAPTER FOUR

DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

This analysis starts by showing validity of data to be analyzed. Next follows a descriptive statistical analysis with an objective of showing the relationships between TTs and UTs. The next section attempts to show if the empirical differences observed are statistically significant. Each analysis will be accompanied with findings and some interpretations where necessary. The last section is a discussion of findings and their implications.

4.2 Validity of data

The objective is to show that the cell frequencies displayed in figures 2 and 3 did not fall there by chance. Parts of figures 2 and 3 have been reproduced as figures 4 and 5. All columns are included but only rows 2, 4 and 8 are reproduced. These are enough to test the matrices for chance loadings in cells.

f_o is observed frequency while f_e is the frequency that could be expected to fall in each cell by chance. f_e was calculated for each cell by multiplying the row and column totals and dividing the

product by the matrix total.

Chi square (X^2) test was performed on each matrix (figures 4 and 5) and the result was as in table 4.

TABLE 4: RESULTS OF X^2 TEST

	df	X^2	Comments
TTs	8	3196.7	Significant, $P < .005$
UTs	8	3305.0	Significant, $P < .005$

TTs

	1	2	3	4	5	6	7	8	9	10	Total
fo	17	33	72	159	162	42	19	235	38	100	877
2 fe	6.6	44.7	47.5	174.9	131.7	52.9	33.8	265.6	21.5	97.9	
fo	12	53	21	790	454	148	142	2585	193	945	5343
4 fe	40.3	272.3	289.2	1063.9	802.4	322.5	205.8	1617.9	130.8	596.2	
fe	57	495	524	1325	1096	498	278	632	48	227	5174
8 fo	39.0	263.7	280.0	1032.0	777.0	312.3	199.2	1566.7	126.6	577.3	
											11400

Fig. 4 : Part of Cumulative Cell frequencies (fo) for TTs with frequencies expected by chance fe

UTs

Cat.	1	2	3	4	5	6	7	8	9	10	Total	
2	fo	2	18	36	114	146	28	14	260	33	72	723
	fe	2.5	34.2	42.8	140.1	124.6	41.9	24.0	213.6	12.3	86.9	
4	fo	10	65	14	775	383	123	92	2385	117	979	4943
	fe	17.3	233.8	292.8	958.0	852.1	286.7	163.9	1460.1	84.3	594.0	
8	fo	25	416	575	1156	1290	461	244	472	30	217	4886
	fe	17.1	231.1	289.4	947.0	842.3	283.4	162.1	1443.3	83.3	287.1	
												10552

Fig. 5 : Part of Cumulative Cell frequencies (fo) with frequencies expected by chance for UTs

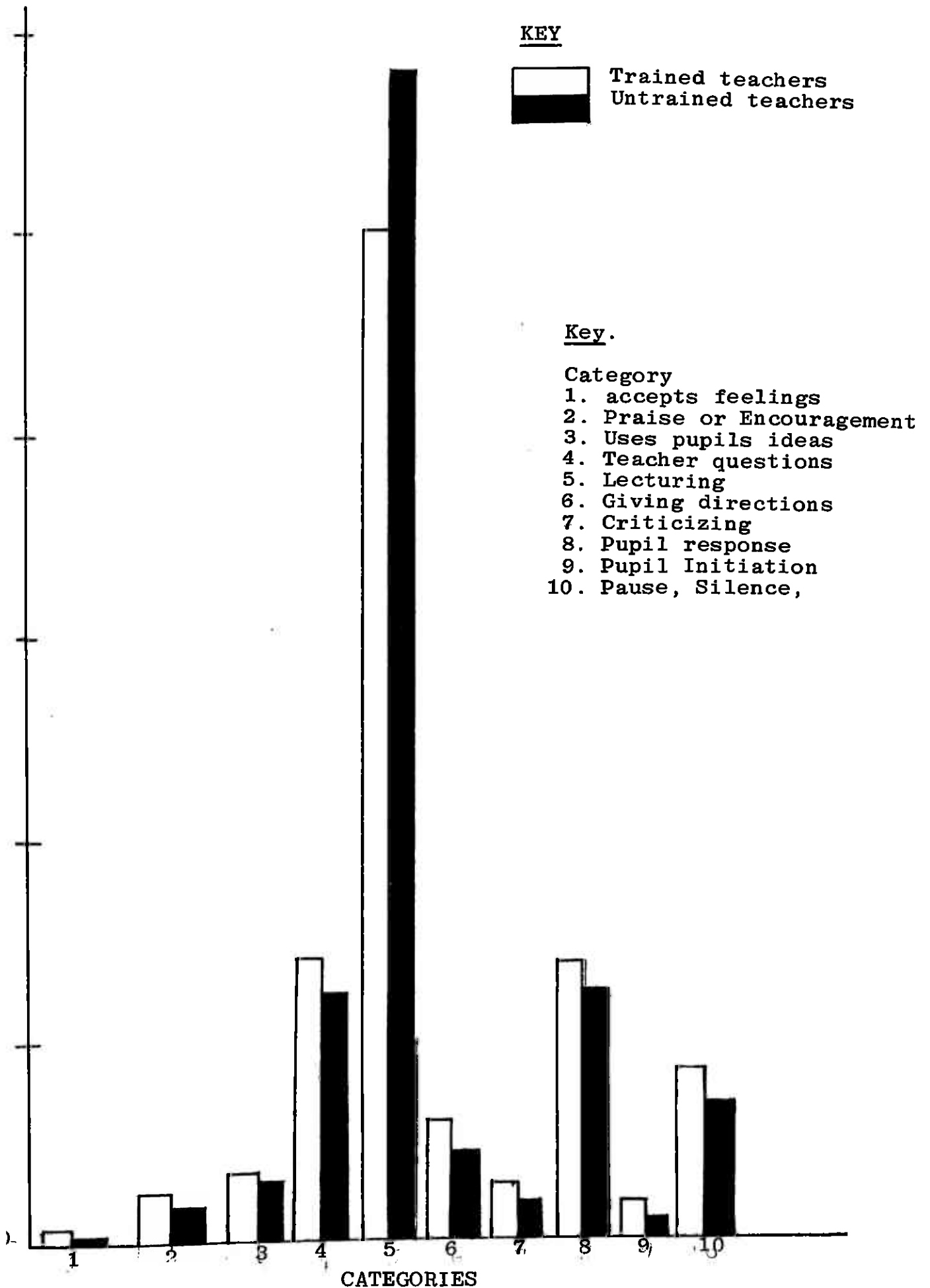
The results show that the probability that the cell frequencies could be due to chance is less than 0.5%. This means that the coding of classroom events had a high reliability.

4.3 Descriptive Analysis

The total time spent in each category of FIAC can be used for comparison. Figures 2 and 3 displayed percentage scores in each category for trained and untrained teachers respectively. These values were used to draw figure 6, a histogram, comparing TTs and UTs. Those unfamiliar with FIAC categories are referred to Appendix I. Finding that can be observed from figure 6 is

- (I) TTs spent more time in all FIAC categories except category 5, lecturing, where UTs spent more time. Going by categories from 1 to 10, this is interpreted to mean:
 - (a) TTs spent more of their time accepting pupils' feelings than UTs.
 - (b) TTs spent more of their time praising and encouraging their pupils than UTs.
 - (c) TTs spent more of their time in using ideas expressed by pupils.
 - (d) TTs spent more of their time asking questions than UTs.

Fig. 6 Histogram showing percentages in categories



- (e) UTs spent more of their time lecturing to their pupils than did TTs.
- (f) TTs spent more of their time criticising their pupils than UTs.
- (g) TTs gave their pupils more time to respond to them than did UTs.
- (h) Pupils in classes of TTs spent more time in initiating their ideas than those in classes of UTs.
- (i) TTs spent more of their time in silence or pauses than UTs.

So in general TTs were different from UTs in all the categories. By looking at fig. 6 we notice too much time was expected in science teaching.

Table 6 displays mean scores and standard deviations in all variables for TTs and UTs. Thorough definitions of the variables are in Sec.1.8.0.

Standard deviations measure variability or lack of homogeneity in a variable. When scores cluster around the mean, standard deviation will be small; as cases spread out, deviations increase. From table 6 we find that scores were very unstable, especially Pupil Intiation, PIR. There was no much difference between UTs and TTs in their deviations from mean scores.

Mean scores in table 6 were used to draw fig. 7. a histogram compairing mean scores of TTs and UTs. In some cases the scores expected of average performance were derived from table 1. Where the average value is hard to fix. FR, flexibility, should be as close to 1 as possible; SC should be present in science classes. Pupil talk, PT should be as low as possible to enable pupil talk to be as high as possible.

From fig. 7, we find that TTs and UTs were different in all the variables and these are :

- (1) TTs are more flexible than UTs (hypothesis 8
(H.8)

Table. 6: Mean scores and standard deviation

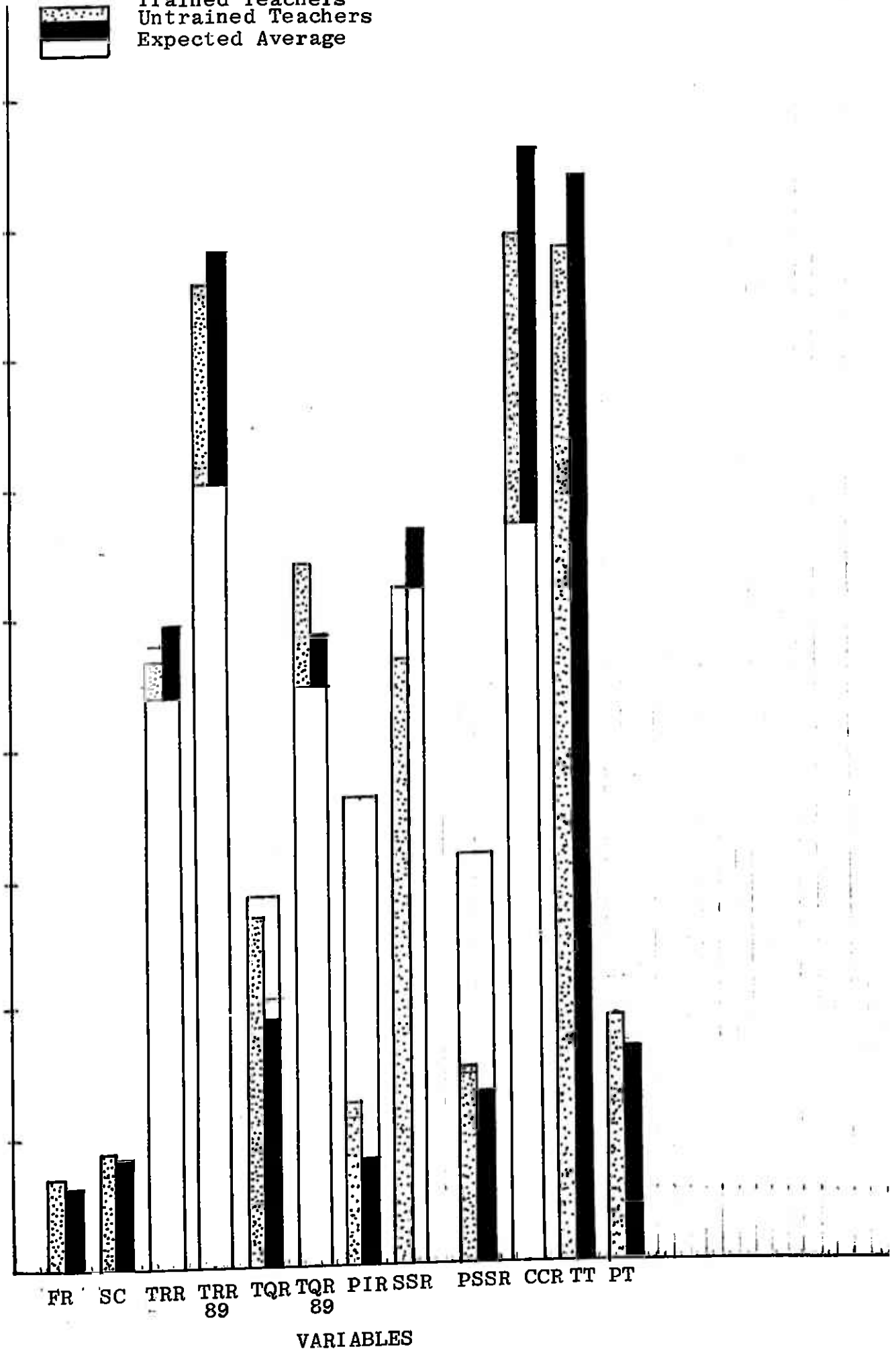
Variables	<u>Trained</u>		<u>Untrained</u>	
	Mean	s.d	Mean	s.d
FR	.628	.11	.568	.11
SC	8.1	3.66	7.88	3.8
TRR	45.28	20.3	46.9	13.9
TRR89	75.05	11.5	78.4	19.8
TQR	24.6	11.2	18.9	8.2
TQR89	53.68	17.4	46.1	14.3
PIR	10.93	10.7	9.15	6.0
SSR	46.4	12.2	55.8	12.0
PSSR	13.18	8.7	10.8	7.0
CCR	78.18	10.8	83.98	7.7
TT	77.0	6.2	80.6	5.9
PT	15.56	5.33	12.88	5.2

Fig. 7 · Histogram showing variables

KEY



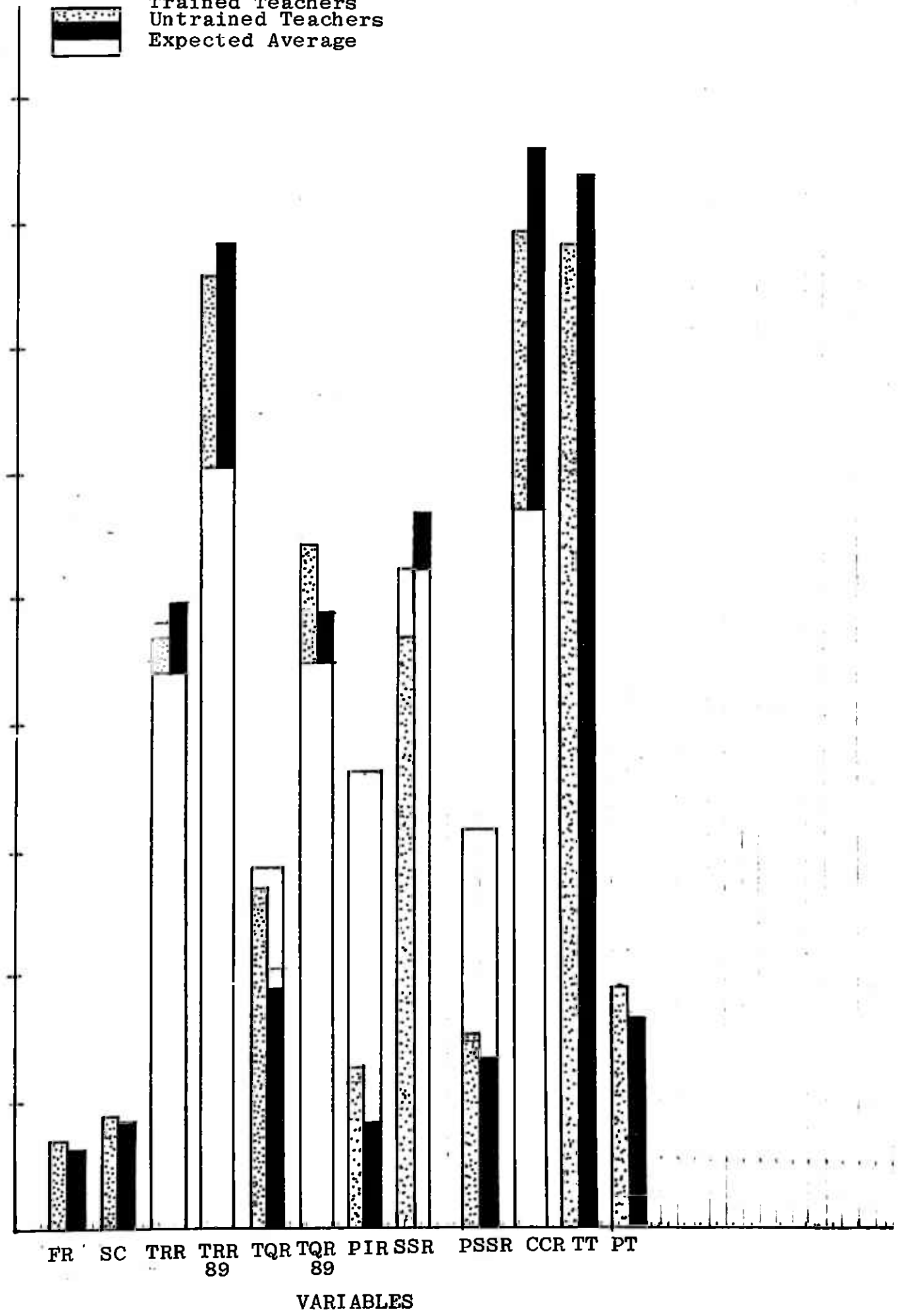
Trained Teachers
 Untrained Teachers
 Expected Average



VARIABLES

Fig. 7 · Histogram showing variables

KEY
Trained Teachers
Untrained Teachers
Expected Average



- (2) TTs have more periods of silence or pauses (H.3).
- (3) TTs have more tendency to use questions to guide pupils rather than lecture (H.5).
- (4) Pupils in classes of TTs initiate more ideas (H.6) and have more time to talk among themselves (H.2).

UTs have higher means in TRR and TRR89. Both means are higher than average and so TTs are nearer the average. High TRR indicates that the teacher talks to pupils more than the reverse and he pays less attention to other aspects of teaching. This shows that TTs respond more to pupils talk and feelings (H.4).

SSR is inversely related to rapidity of interchange between the teacher and pupils. Interactions are less rapid in classes of TTs than those of UTs. Since TTs were below average while UTs were above average. High CCR (content emphasis) indicates that the main focus of class discussion is on subject matter, that a teacher takes a very active role, and little attention is paid to motivation and discipline problems. This is more true of UTs than TTs according to the mean scores in CCR (H.7), though the scores are all above average. Finally, TT shows that UTs talk more than TTs.

The differences discussed here are empirical

differences and the next task is to show whether these differences are statistically significant.

4.4 Tests for Significance

Statistical t-test was used to test whether the differences that were found in Section 4.3 were significant. Statistical Packages for social sciences (SPSS) were used in the following analysis. The tests were carried out against the hypothesis stated in Section 1.7. Tables accompanying the t-tests have a column, Ho, where it is indicated whether null hypothesis that no difference existed in the variable is accepted or rejected.

Table 7 displays results of t-test between TTs and UTs in all the variables. t-values that show significant difference are marked to show levels of significance. From table 7 we find that:

- (a) Trained teachers are more flexible than UTs
- (b) There is no difference in periods left for silence or pause.
- (c) There is no difference in teacher response to pupils.
- (d) There is no difference in teacher response to pupil talk.
- (e) TTs asked more questions than UTs.
- (f) TTs had a greater tendency to ask questions than to lecture when compared to UTs.

- (g) Pupils in classes of TTs initiated more ideas than those in classes of UTs.
- (h) Teacher pupil exchanges were less rapid in classes of UTs.
- (i) There was no difference in continued talk between pupils.
- (j) UTs emphasized content more than TTs.
- (k) UTs talked more in class than TTs.
- (l) Pupils in classes of TTs talked more than those in classes of UTs.

Table. 7: T-test for results for mean differences between TTs and UTs

Variable	Means		t value	Ho
	TTs	UTs		
FR	0.628	0.568	2.375 ⁺	reject
SC	8.100	7.875	1.218	accept
TRR	45.275	46.925	0.420	accept
TRR89	75.050	78.425	1.322	accept
TQR	24.600	18.925	2.569 [*]	reject
TQR89	53.675	46.075	2.130 ⁺	reject
PIR	10.925	9.150	2.286 ⁺	reject
SSR	46.600	55.825	3.407 [*]	reject
PSSR	13.175	10.825	1.347	accept
CCR	78.175	83.975	3.495 [*]	reject
TT	77.000	80.600	2.595 ⁺	reject
PT	15.550	12.875	2.245 ⁺	reject

+ one-tail $P < .025$

* one-tail $P < .01$

It should be noted that even in cases where the null hypotheses were accepted, TTs had superior mean scores. Results above support the main hypothesis and the sub-hypotheses from 1-8 (See Sec. 1.7.0)

Table 8 presents t-test results carried out to determine whether any differences in the variables could be caused by professional grades, P1 and P2, among TTs. We find that all t-values were not significant, implying that professional grades of TTs could not create a difference in their verbal instructional behaviour. Signs are placed on Column Ho to indicate which group, P1 or P2 had a superior mean and we find that P1s had most mean scores in their favour, i.e. P1s were slightly better than P2s.

It was then attempted to find out whether dividing teachers into two by age would cause difference in verbal behaviour. Those teachers aged 27 years or less formed one group and the remaining formed the second. Table 9 displays results found in the case of TTs. No significant difference was found by t-values but as indicated in column Ho, those aged 27 or less tended to have most means in their favour. Table 10 presents results similar to those in 9 but for UTs. No differences are significant in Table 10 and it is also impossible to tell which group have superior means. What appears

Table. 8 T-test results for mean differences between P1s and P2s

Variable	Means		t-value	Ho
	P1s	P2s		
FR	0.573	0.644	1.083	accept [*]
SC	7.909	8.333	0.354	accept [*]
TRR	41.591	49.722	1.256	accept ⁺
TRR89	74.773	75.388	0.164	accept ⁺
TQR	25.909	23.000	0.808	accept ⁺
TQR89	55.682	51.222	0.799	accept ⁺
PIR	12.000	9.610	0.695	accept ⁺
SSR	44.591	48.556	1.014	accept [*]
PSSR	13.818	12.389	0.521	accept ⁺
CCR	76.773	80.444	1.488	accept ⁺
TT	76.182	78.000	0.876	accept ⁺
PT	16.409	14.500	1.114	accept ⁺

+ in favour of P1s
 * in favour of P2s

Table. 9 T-test results for mean differences among TTs divided by Age

Variable	Means		t-value	Ho
	≤27	>27		
FR	0.637	0.576	0.916	accept ⁺
SC	8.421	7.809	0.514	accept ⁺
TRR	48.421	42.381	0.928	accept [*]
TRR89	76.737	73.524	0.865	accept [*]
TQR	26.421	22.952	0.971	accept ⁺
TQR89	53.105	54.190	0.194	accept ⁺
PIR	12.789	9.238	1.045	accept ⁺
SSR	43.789	48.714	1.274	accept ⁺
PSSR	14.263	12.190	0.762	accept [*]
CCR	78.314	78.524	0.082	accept
TT	76.368	77.571	0.579	accept ⁺
PT	16.053	15.095	0.554	accept ⁺

+ in favour of ≤27 years
 * in favour of >27 years

Table. 10: T-test results for mean differences among UTs divided by Age

Variable	Means		t value	Ho
	≤ 27	> 27		
FR	0.586	0.505	1.299	accept ⁺
SC	7.182	6.888	0.236	accept ⁺
TRR	47.000	47.056	0.012	accept [*]
TRR89	78.636	78.111	0.144	accept ⁺
TQR	20.363	17.111	1.239	accept ⁺
TQR89	48.591	44.050	1.001	accept [*]
PIR	6.545	6.333	0.0109	accept ⁺
SSR	55.045	56.727	0.429	accept [*]
PSSR	11.182	10.333	0.376	accept ⁺
CCR	84.136	83.722	0.178	accept [*]
TT	80.591	80.556	0.018	accept ⁺
PT	12.227	13.227	0.479	accept [*]

+ in favour of ≤ 27 years
 * in favour of > 27 years

tends to suggest that the older the better.

An attempt was also made to see whether division into two by experience could indicate a difference in teachers' verbal behaviour. Those with past experience less or equal to 3 years formed one group and the rest the other. Table 11 displays t-test results in the case of TTs. No significant difference is found in any variables but younger TTs tend to have more superior means. Table 12 displays similar results but for UTs. Again no differences are significant and it is hard to determine which group is better than the other.

Significant tests carried with age and experience by the divisions above could only give a direction as to which group was better. A more important question that normally arises is whether one can predict classroom effectiveness through a teachers experience or age or both, can teachers be awarded something on the basis of their experience? The investigator tried to find out whether scores in the variables could have been predicted by the teachers age or past experience.

Regression analysis can be used for such prediction. Age and Experience were used as dependent variables for regression analysis.

Multiple regression coefficients, R , are given in tables 13, 14 and 15. Columns of R^2 are a

Table. 11 : T-test results for mean differences among TTs divided by Experience

Variable	≤ 3 yrs	>3 yrs	t-value	Ho
FR	0.581	0.632	0.762	accept*
SC	8.143	8.053	0.076	accept ⁺
TRR	45.666	44.789	0.133	accept ⁺
TRR89	74.714	75.421	0.189	accept ⁺
TQR	24.571	24.632	0.017	accept ⁺
TQR89	53.762	51.737	0.357	accept*
PIR	11.238	10.579	0.191	accept ⁺
SSR	46.619	46.105	0.130	accept ⁺
PSSR	13.429	12.895	0.195	accept ⁺
CCR	77.714	78.684	0.384	accept ⁺
TT	76.809	77.212	0.192	accept ⁺
PT	15.620	15.473	0.083	accept

+ in favour of ≤ 3 yrs

* in favour of >3 yrs

Table. 12 : T-test results for mean differences among UTs divided by Experience

Variable	≤ 3 yrs	>3 yrs	t-value	Ho
FR	0.524	0.573	0.762	accept*
SC	6.520	7.933	1.127	accept*
TRR	47.080	46.666	0.089	accept ⁺
TRR89	78.080	78.933	0.228	accept*
TQR	18.320	19.066	0.564	accept*
TQR89	46.640	45.066	0.331	accept ⁺
PIR	6.880	5.733	0.576	accept ⁺
SSR	57.240	53.400	0.964	accept ⁺
PSSR	12.000	8.800	1.414	accept ⁺
CCR	84.760	82.600	0.914	accept*
TT	81.320	79.333	0.976	accept ⁺
PT	12.360	13.666	0.749	accept*

+ in favour of ≤ 3 yrs
 * in favour of >3 yrs

measure of association when our concern is with the strength of the relationship rather than the direction. It is a measure of the proportion of variance explained. Percentage explained is given in Column 3.

Table 13 gives regression coefficients with age as a dependent variable for TTs and UTs. From the top of the table, the variables are arranged from least explained or predictable to the most explained by the dependent variable or from one with the lowest multiple R to that with the highest or from least correlated to most correlated. (For any difficulties in definitions of the variables refer to Section 1.8.0)

Consider Pupil Initiation, PIR in table 13. It is least explained by Age for TTs (4.2%) but most explained in the case of UTs (28.8%). which is significant. The following are the conclusions that can be made from table 13.

- (a) Age was positively correlated to scores of TTs and UTs which mean that as Age increases a teacher's classroom verbal behaviour would increase towards some pattern.
- (b) There is difference between TTs and UTs in the way age explains scores in the

variables.

- (c) Age is a stronger predictor of scores of UTs than those of TTs.

Table 14 displays results of regression analysis with experience as dependent variable. We again find that those variables least explained in the case of TTs are most explained in the case of UTs for example content emphasis, CCR. From table 14 we find that:

- (a) Past experience is positively correlated to scores in variables for both TTs and UTs meaning that teachers verbal behaviour should increase with experience.
- (b) While TTs have no variable significantly explained by their past experience, UTs have important variables significantly explained by their past experience.

Table. 13 : Regression Coefficients, R, dependent on AGE

	<u>TTs</u>				<u>UTs</u>		
	Multiple R	R ²	Percentage Explained		Multiple R	R ²	Percentage Explained
PIR	.205	.042	4.2	SSR	.249	.062	6.2
TRR89	.259	.067	6.7	CCR	.354 ⁺	.124	12.4
TQR89	.322 ⁺	.103	10.3	PT	.402 [*]	.162	16.2
SSR	.352 ⁺	.124	12.4	SC	.463 [*]	.214	21.4
PT	.403 [*]	.163	16.3	FR	.493 [*]	.243	24.3
CCR	.445 [*]	.198	19.8	TT	.508 [*]	.258	25.8
FR	.449 [*]	.202	20.2	TRR89	.519 [*]	.269	26.9
SC	.451 [*]	.204	20.4	TQR89	.528 [*]	.279	27.9
TT	.459 [*]	.211	21.1	PIR	.536 [*]	.288	28.8

* significant at $P < .01$

+ significant at $P < .05$

Table. 14 : Multiple Regression Coefficients, R, dependent on Experience (EXP)

<u>Trained Teachers</u>				<u>Untrained Teachers</u>			
	Multiple R	R ²	Percentage Explained		Multiple R	R ²	Percentage Explained
TQR89	.097	.009	0.9	CCR	.168	.028	2.8
FR	.121	.014	1.4	TRR89	.203	.041	4.1
PT	.130	.017	1.7	SSR	.229	.052	5.2
SSR	.156	.024	2.4	TT	.258	.066	6.6
PIR	.170	.028	2.8	FR	.277	.077	7.7
TRR89	.178	.032	3.2	PIR	.331 ⁺	.109	10.9
TT	.184	.034	3.4	TQR89	.343 ⁺	.117	11.7
SC	.206	.042	4.2	SC	.354 ⁺	.125	12.5
CCR	.208	.043	4.3	PT	.444 [*]	.197	19.7

* Significant at $P < .01$

+ Significant at $P < .05$

Table. 15 : Regression Coefficients, R, dependent on Age and EXP. for all Teachers.

	<u>EXPERIENCE</u>			<u>AGE</u>			
	Multiple R	R ²	Percentage Explained		Multiple R	R ²	Percentage Explained
PT	.147	.021	2.1	PIR	.262	.068	6.8
SC	.159	.025	2.5	TRR89	.287	.082	8.2
TT	.217	.047	4.7	PT	.308 ⁺	.094	9.4
SSR	.226	.051	5.1	SSR	.376 ⁺	.141	14.1
CCR	.230	.053	5.3	TQR89	.381 ⁺	.145	14.5
TRR89	.236	.055	5.5	TT	.383 ⁺	.147	14.7
FR	.237	.056	5.6	SC	.386 ⁺	.148	14.8
PIR	.238	.056	5.6	CCR	.387 ⁺	.150	15.0
TQR89	.239	.057	5.7	FR	.388 ⁺	.150	15.0

+ Significant at $P < .05$

Finally, all the teachers were combined and regression analysis performed with age and past experience to check prediction under general circumstances. Table 15 displays the results. There is still some difference in the order in which the variables are explained, those least explained in the case of UTs appear to be most explained for TTs. Under these circumstances,

- (a) Age and Experience are positively correlated to scores in all variables implying that scores in variables increase as age and experience measure.
- (b) Past experience does not significantly explain any variable.
- (c) Age significantly explained almost all variables.

These findings indicate that under general circumstances age is more important as a consideration for performance than past experience.

4.5. Drill Teaching

FIAC system used in this study can inspect patterns used in teaching. The drill pattern or checking facts by short-teacher questions which are followed immediately by short-pupil questions can be inspected from a completed matrix. In drill teaching teacher's questions are short and narrow and therefore limit pupil response. These patterns are normally recorded in observation sheet as a series of involving category 4 and 8 and take the pattern: 4,8,4,8,4,8,8,4,8,4,4 and so on. When transferred to a matrix they fall on cells (4-4), (4-8), (8-4) and (8-8). By inspecting loadings on these cells we can judge the proportion of occurrence of the pattern given the matrix total and loadings expected by chance.

From Commulative matrices in fig. 2 and 3 we extract loadings for drill cells above for TTs and UTs respectively. These are presented below as figs. 8 and 9 respectively.

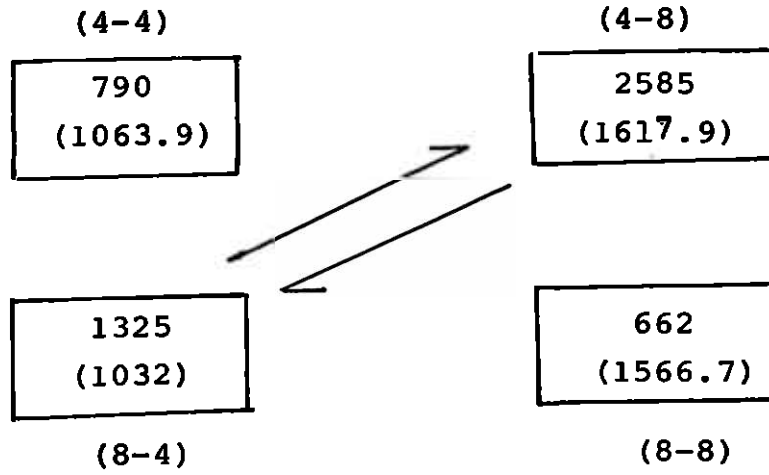


Fig. 8 TTs

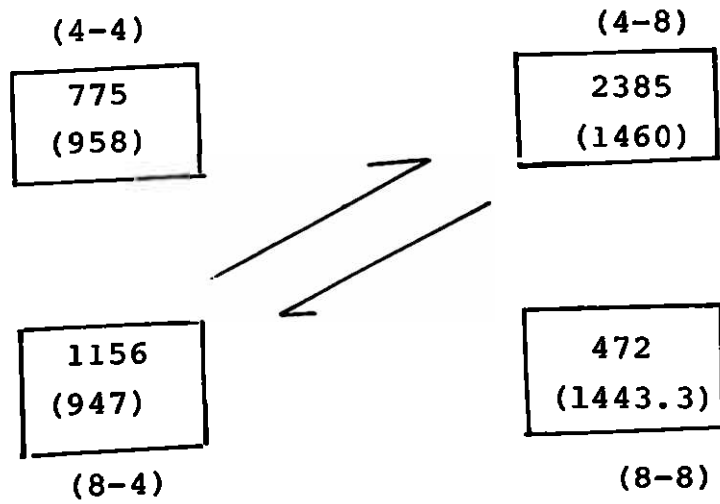


Fig. 9 UTs

Shown in brackets are cell loading expected by chance extracted from Figs 4 and 5 respectively.

We find loading much higher than normal. In a more inquiry pattern Cells (4-4) and (8-8) could have had comparatively higher loadings as the teacher would be asking long questions which would let pupils talk more or offer long answers. The high interactions shown by arrows in Cells (8-4) and (4-8) show that instances of short question, short answer were plenty. These are true in both figures and are characteristic of drilling or revision classes where the teacher is continuously giving out facts. Teaching science in this way does not promote concept formation and so little is learnt that is permanent.

4.6 Creative Inquiry Pattern

It is believed that science teaching should promote creativity through inquiry teaching. Pupils are guided into discovering the concept to be learnt. To participate in inquiry pupils must be able to express their own ideas. The teacher asks questions by making use of ideas expressed by pupils as opposed to teacher directed drill pattern. These involve the use of Category 3 and 9. An inquiry pattern may be coded as 9,9,3,3,3,9,3,4,4,9,9,8..... The important cells in the matrix are (3-3), (9-3) (9-9),

inquiry teaching. In table 16, SC, TRR and TQR form a correlation matrix with PIR, PSSR and PT both for UTs and TTs.

Table 16: Pearson Correlation Coefficients testing creative inquiry Teaching together with levels of significance*

	<u>Trained Teachers</u>			<u>Untrained Teachers</u>		
	PIR	PSSR	PT	PIR	PSSR	PT
SC	0.5156 S0.001	0.4478 S0.002	0.0277 S0.433	-0.0363 S0.412	-0.0855 S0.300	0.1576 S0.166
TRR	-0.2087 S0.098	-0.1353 S0.203	0.4142 S0.004	0.1552 S0.169	0.2240 S0.082	0.4445 S0.002
TQR	0.3699 S0.009	0.4029 S0.005	0.4958 S0.001	-0.1029 S0.264	0.0812 S0.309	0.3138 S0.024

* A correlation ≥ 0.302 is significant at $P < .05$

Trained teachers had significant correlations except in TRR with PIR and PSSR; and SC with PT. On the other hand UTs had only two significant correlations; TRR with PT and TQR with PT. Table 16 reveals a difference between TTs and UTs in Creative Inquiry teaching.

4.7 Summary of Findings

The following are significant findings according to data analysis in sections 4.3 to 4.6:

1. Trained Teachers scored higher percentages than Untrained Teachers in all the FIAC categories except category 5 (Lecturing) where UTs scored a higher percentage.
2. TTs were more flexible than UTs.
3. TTs talked less in class than UTs.
4. Pupils in classes of TTs talked more than those in classes of UTs.
5. There was no difference between TTs and UTs in duration they left for pauses, silence or confusion.
6. There was no difference in response to pupil talk.
7. Trained teachers had a greater tendency than UTs to use questions that guide content oriented discussion as opposed to lecturing.
8. Pupils in classes of TTs initiated more ideas of their own than those in classes of UTs.
9. TTs emphasized content less than UTs, i.e. TTs took less active role in classroom discussion than UTs.
10. Teacher-Pupil exchanges were less rapid in classes of UTs than in those of TTs.

11. Professional qualifications, P1 and P2, were found to cause no significant difference in the teachers' behaviour, i.e. no significant difference was found in scores in all the variables.
12. When TTs were divided by Age, no significant difference was found in any variable.
13. When UTs were divided by Age, no significant difference was found in any variable.
14. Past Experience of TTs did not significantly cause difference in any variable.
15. When divided by experience, no significant difference was found in scores of UTs in any variable.

4.1.2 Predicting Performance from Age and Experience

Regression analysis performed on Age and experience of the teachers revealed that (Tables 13,14,15).

16. Age of TTs and UTs was positively related to their classroom instructional behaviour.
17. Past experience of TTs and UTs was positively related to their classroom Instructional behaviour.
18. Instructional behaviour of TTs is significantly predicted by their Age.
19. Instructional behaviour of UTs is significantly predicted by their Age.

20. Age is stronger predictor for Instructional behaviour of UTs than those of TTs.
21. When all teachers were combined, Age of the teachers was positively related to and significantly predicted classroom instructional behaviour.
22. Past experience of TTs and UTs was positively related to their classroom instructional behaviour.
23. When TTs were divided by experience no significant difference was found.
24. When UTs were divided by experience some variables were significantly predictable by experience namely PIR, SC, PT and TQR89.
25. When all teachers were combined past-experience did not predict any Instructional behaviour of the teachers.
26. Both TTs and UTs taught by the drill method.
27. TTs taught more by creative-inquiry method than UTs.

4.8 Interpretations

Findings in the Section 4.7 were numbered from 1 to 27. In the following sections numbers in brackets will refer to the findings.

Some findings were self-explanatory but some need interpretation.

Finding (1) means that TTs spent more of their time than UTs in:

- (a) accepting and clarifying attitudes and feelings of pupils
- (b) praising and encouraging pupil action or behaviour
- (c) using ideas expressed by pupils
- (d) giving directions to pupils
- (e) asking pupils questions
- (f) criticizing and justifying their authority
- (g) allowing pupils to respond and initiate their ideas
- (h) periods of silence or pause and that UTs spent more of their time leacuring than did TTs.

Finding (2) implies that TTs integrated more teaching methods than UTs while (3) and (4) reveal that TTs allowed more time or opportunity for their pupils to talk than did UTs. This is why we find that they talked less and their pupils talked more.

Finding (5) tells us that both trained and untrain-

ed teachers tolerated silence or provided periods of pauses in their classes in the same way while (6) reveals that both had the same tendency to react to feelings and ideas expressed by pupils. (7) reveals that TTs used more questions as compared to lecturing to pupils and in (8) we find that TTs gave pupils more opportunities to initiate their ideas.

Finding (9) reveals that UTs take more active role in class discussion than TTs and the discussion is mainly focused on content. The less rapidity of teacher-pupil exchanges in classes of UTs is an indication that either the pupils, the teacher or both tended to remain in a single category longer than in classes of TTs. Whether a teacher is a P1 or a P2 could not be distinguished by observing their classroom instructional behaviour (11).

Division by Age did not cause any difference may be due to the nature of division. Experience also caused no difference when teachers were grouped, (12-15). Because instructional behaviour of all the teachers is that as age of a teacher increases the effectiveness of his classroom instructional behaviour increases (16). Past experience was also positively related to behaviour of both trained and untrained teachers, (17), (22). These tie up with findings 18-21 which assert that instructional behaviour of TTs and UTs can be predicted by age and experience.

Experience is more useful and can be better predicted in the case of UTs (24) and when all teachers are put together experience has no significant prediction power (25).

In (26) we found that both teachers taught science by drill method and here there was no comparison. Finding (27) does not mean that UTs never had any characteristics of teaching by inquiry; it only means that when compared trained teachers taught their lessons more by creative inquiry methods.

4.9 Discussion

High percentage scores in FIAC categories one to four is a good trait in that category one makes sure that teacher recognizes individual differences in pupils and reacts to them (1). Both trained and untrained teachers had extra-ordinarily low percentage scores in category one. Only alert teachers can notice and react to pupils' feelings. Throughout the observations some teachers never accepted pupils' feelings even once. Scores in categories two and three were similarly low. Though trained teachers were better, as science teachers, reinforcement and use of pupils' ideas should have spent a bigger percentage of their time. Teacher questioning was low. UTs spent a bigger percentage of their time lecturing than TTs but the domination of the class through lecturing was

too high for both. Lecturing is not bad but the proportion of it really matters. Too much of it is normally undesirable in Science teaching.

Giving direction to pupils may be positive or negative on pupil behaviour. Some directions are necessary and beneficial to pupils but too much of it may cause negative effects on pupils as it can limit their freedom of participation. The above argument holds true for criticism of pupils. Percentage score in criticism was fair.

Pupil-talk in science classroom should in theory be higher than that of teachers. Scores in pupil-talk by both trained and untrained teachers were quite low; an indication of teacher-domination of classroom activities.

2/ Teachers' flexibility should be as high as possible (2). Both trained and untrained teachers scored an average flexibility though the scores were not stable (large standard deviation). Flexibility should be as high as possible as it is a measure of a teacher's creativity. A flexible teacher will be receptive to pupils' ideas.

Amount of talk in the class is a measure of classroom participation. Trained teachers were found to talk less than UTs in class (3). If this is true, it means that pupils in classes of trained teachers

should talk more than those in classes of UTs. This was true (4). This further implies that pupils in classes of trained teachers initiated their ideas more than those in classes of UTs. This was also true (8). Pupil initiation is definitely triggered by teacher questions. It was found (7) that trained teachers had a greater tendency than UTs to use questions that guide content-oriented discussion as opposed to lecturing.

Talking more or lecturing is a measure of content emphasis. (9) found UTs to emphasize more on content by playing more active role than their pupils. For science education, the subject matter merely forms scaffold for its learning, and the activities of the teacher should emphasize on the method of acquisition of scientific knowledge. When a lot of time is spent on lecturing, teacher-pupil exchanges are minimized. This is why it was found (10) that teacher-pupil exchanges, were slower in classes of UTs.

Teachers' toleration of periods of silence or pause allows pupils, even slow thinkers, to formulate their answer or ideas and express them. Such toleration would increase pupil-initiation and pupil-talk. Since trained teachers had a superior pupil initiation they would be expected to score a high value in silence. However, no significant difference was found but trained teachers had a higher mean score and this shows

consistency. The above argument was also true in teacher response to pupil-talk (6). Since educational qualifications of the teachers were the same, it was interesting that their professional grades (P1 and P2) never showed in their classroom verbal Instructional behaviour.

Age and past experience are important factors in teaching. Age is important because people normally forget what they have learnt as some function of time elapsed while experience of a teacher should increase effectiveness through opportunity to practise. It is found here that as age increases a teacher's classroom instructional behaviour should be more facilitating to learning. There has to be a limiting age where a teacher's effectiveness should decrease. Past experience was also found to increase with effectiveness of verbal instructional behaviour. Relationships were not significant in the case of trained teachers. UTs made more use of their experience. Age was also a stronger factor for UTs than TTs. This means that any trained teacher tends to be lazier compared to a similar UT. UTs appear to be putting more competitive effort than their Trained counterparts although the latter are better off because of their training which enables them to orient the pupils (audience). Even in prediction of performance by experience none of

the variables could be significantly predicted in the case of TTs but UTs had some variables significantly predicted. When all teachers were combined experience was not a significant predictor but age was significant (Table 15). Age should be given more consideration.

Drill teaching is characterized by short question and short answer between the teacher and pupils. It is believed that broad or open-ended questions are more useful in science teaching since they cause divergent thinking and so should be used in creative inquiry teaching. Drill teaching that was found was a sign of the teacher's attempt to lecture or pour knowledge to pupils. In science teachers are expected to stress on the process of investigative and justify capacity rather than acquiring knowledge. This creates in pupils an inquiring mind and increases their participatory experiences. In inquiry teaching, teacher questions should be significantly related to pupil-talk and pupil-initiation. (See table 16). This was only true of trained teachers.

4.10 Evaluation

This section evaluates the performance of trained and untrained teachers in the variables on the basis of what could be expected of average performance (See table 1).

Teacher-response was average but flexibility should have been higher since it is a measure of integration of skills. Teacher-response to pupil-talk was too high. This meant that the teachers always reacted to the ideas and feelings of pupils or else gave encouragement. Reaction to ideas or feelings was rare since the ideas were also rare and so the high response was because of too frequent short praises which implies teaching by drill or recitation. Chorus answers, was one source of high teacher domination. Chorus answers were too much, especially with UTs. Most directions from the teacher were for pupils to recite what he has said.

Teacher questioning was slightly below average. Most questions were observed to be caused by difficulty in understanding English Language. A teacher would ask a question, get silence and then repeat the question in the local language and get a response.

Pupil-Initiation was extraordinarily low for science classes. This is an index of poor teaching.

Pupil-Initiation stood at 13 compared to an expe-

cted value of 34.

There was too much emphasis on content. The average expected was 55 but scores for TTs and UTs were 78 and 84 respectively. This meant that teachers took too active role in class discussion and never gave their pupils enough chance to participate. This is further evidenced by very high scores in teacher-talk and low scores in pupil-talk. This is not favourable to the teaching of science.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The study reported here derives its significance from the large numbers of untrained teachers in Kenyan primary schools and the alarm so far raised by the public in desire to have objective information concerning their teaching effectiveness. The objective of the descriptive analysis was to compare the differences that may exist between trained and untrained teachers in their verbal instructional behaviour and how their behaviour may facilitate learning in science classrooms. It was believed that pupil learning can be measured through observations that reveal changes in behaviour. Effective teachers were those that can facilitate pupil learning through use of a wide band of behaviour.

The sample comprised of 40 trained and 40 untrained standard 6 and 7 science teachers selected from 34 primary schools. Flanders Interaction Analysis Category System was to observe three science lessons spread over a period of one term.

Data was analysed both descriptively and statistically and summary of findings has already been presented in Section 4.7.

The study had addressed itself to these two major questions:

- (1) In term of possible facilitation of learning, are there any verbal instructional behaviour differences between trained and untrained teachers and what are the implications of the differences?
- (2) Is age, past experience or professional grade of a teacher a factor in his verbal instructional behaviour?

It was further hoped that findings would be useful to the Ministry of Basic Education in respect to teacher training.

5.2. General Conclusions

Based on the findings of this study the following conclusions seem to be in order:

1. There is a difference between TTs and UTs in their verbal instructional behaviour and though TTs have more of those behaviour that facilitate more pupil-learning, both TTs and UTs displayed performance below average.
2. Both TTs and UTs dominate their classroom activities through too much talking. UTs talk more in their classes than TTs resulting in pupils in classes of UTs talking less than those in classes of TTs.
3. Both TTs and UTs take a very active role in classroom discussion involving content, resulting in too much emphasis on content. In comparison, TTs take less active role in classroom discussion involving content than UTs.
4. TTs have a greater tendency than UTs to use questions that guide discussion of content as opposed to lecturing. UTs tend to lecture about content where it is possible to deliver content through questioning.

5. TTs enable their pupils to initiate more original ideas than UTs. In general, pupil initiation of their ideas is much lower than would be expected of science lessons.
6. There is no difference in the way TTs and UTs respond to pupils' response or questions. TTs are better at responding to ideas expressed by pupils - a sign of effective teaching.
7. TTs use more teaching skills than UTs.
8. Whether a teacher is a P1 or P2 causes no difference in verbal instructional behaviour.
9. Age of a teacher is a very significant factor in predicting his verbal behaviour whether he is trained or untrained and even more so if he is untrained. Effective performance increases with age to some critical value where effectiveness should start falling.
10. Past teaching experience is a significant predictor of verbal instructional behaviour of UTs but not that of TTs.
11. When all the teachers are combined age of the teacher significantly predict verbal behaviour while past teaching experience does not.
12. Trained teachers are generally lazier than UTs due to lack of commitment to duty.

13. Both TTs and UTs allow too much chorus answers from their pupils.
14. TTs perform better as science teachers compared to UTs.
15. Teaching of science is very poor, It is mainly taught by drill. TTs are superior to UTs in teaching by inquiry.

5.3. Recommendations

1. To improve the quality of teaching, especially that of UTs, short in-service courses should be organised that should be practical in approach; participating teachers should have a chance to practice selected teaching skills and the personnel conducting the courses should be people capable of making objective records (preferably using an observation schedule) to enable them to give reliable feedback on the basis of which teachers may improve their skills.
2. In-service courses should enable teachers to realise:
 - (a) the implications of their domination of all classroom activities.
 - (b) the merits and demerits of too much lecturing to pupils.
 - (c) the importance of pupil participation in all classroom activities and decision making.
 - (d) the effectiveness of teaching by questioning
 - (e) the implication of allowing chorus answers from pupils.
 - (f) that pupils deserve respect whenever they express their opinions or ideas, whether right or wrong.

3. The Inspectorate division of the Ministry of Basic Education should train subject inspectors capable of carrying out systematic observations of classroom procedures with a view to giving feedback and assessing performance. The observation schedule can be developed by the Ministry. These inspectors should visit a school at least one a month. This would reduce laziness of teachers, especially trained ones.
4. The idea of reserving all TTC places to UTs should be discarded and TTCs allowed to select the best 'O' level candidates to join them without first serving as UTs.
5. Educational qualifications of UTs should be as high as possible otherwise if the present trend continues, the teaching profession will be for "academic precipitates".
6. TTCs should recruit UTs with as many years of teaching experience as possible and chronological ages should also be considered. Period of training should never be less than two years.
7. Stipends given in TTCs should be increased to a level where it can enable a UT to support his family if he joins a TTC;

otherwise UTs committed to supporting their families will never join TTCs.

8. Due to lack of scientific apparatus, teachers in service should be encouraged and taught how to improvise local materials e.g. tins bottles etc. to serve as apparatus.
9. Because vernacular language is still used in many rural schools as a medium of instruction, Kenya Institute of Education should develop standard scientific terminology in these language to ease interpretation problems encountered by teachers.
10. UTs posted where they cannot speak the vernacular language are most ineffective and if they cannot be transferred to relevant places, they should only teach in upper primary classes where the level of understanding English is better.

5.3.1 Recommendations for Further Research

- (i) A research should be conducted similar to this one but on a larger scale and to include some variables controlled in this one e.g. sex, size of class etc.
- (ii) A research to investigate further the relationships between the quality of teaching and professional grade, age, past experience.
- (iii) One to investigate the relationship between previous education qualifications and quality of teaching.
- (iv) Study of the effects of teaching science using vernacular language and how it relates to development of scientific concepts.
- (v) To study the relationship between learning environments and pupil achievement.
- (iv) To study the implications of high teacher-pupil ratio.

APPENDIX 1.

Flanders' Interaction Analysis Categories* (FIAC)

TEACHER TALK

Response

1. Accepts feeling: Accepts and clarifies an attitude or the feeling tone of a 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 pupil action or behaviour. Jokes that release tension, but not at the expense of another individual; nodding head, or saying 'Um hm', or 'go on' are included.
3. Accepts or uses ideas of pupils: Clarifying, building, or developing ideas suggested by a pupil. Teacher extensions of pupil ideas are included but as the teacher brings more of his own ideas into play, he shifts to category five.
4. Asks questions: Asking a question about content procedure, based on teacher ideas, with intent that a pupil will answer.

*There is no scale implied by these numbers. Each number is classificatory; it designates a particular kind of communication event. To write these numbers down during observation is to enumerate, not to judge a position on a scale.

Initiation

5. Lecturing: Giving facts or opinions about content or procedures; expressing his own ideas, giving his own explanation, or citing an authority other than a 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 pattern; bawling someone out; stating why the teacher is doing what he is doing; extreme self-reference.

PUPIL TALK

Response

8. Pupil-talk-response: Talk by pupils in response to teacher. Teacher initiates the contact or solicits pupil statement or structures the situation. Freedom to express own ideas is limited.

Initiation:

9. Pupil-talk-initiation: Talk by pupils which they initiate. Expressing own ideas; initiating a new topic; freedom to develop opinions and a line of thought, like asking thoughtful questions; going beyond the existing structure.

Silence:

10. Silence or confusion: Pauses, short periods of silence and periods of confusion in which communication cannot be understood by the observer.

APPENDIX 1V

Department of Educational
Communications & Technology,
P.O Box 43844,
NAIROBI.

Date.....

The Headmaster,

Dear Sir,

You will remember a visit to your school when science
teachers were selected to participate in a research:

TSC.....

For convenience of the proposed observation of these
teachers next term, you are kindly requested to
arrange your time-table so that they teach science

on..... at

.....

The teachers are asked to teach just as they normally
teach without making any special preparations as we
are interested in what normally happens.

Each observation will last about 25 minutes

Thank you in advance.

Yours sincerely,



NAPHY OMBECH ABIDHA

B I B L I O G R A P H Y

- Amidon, J.E and Hough J.B. (Eds). Interaction Analysis: Theory Research and Applications
Addison - Wesley Pub. Co. Inc. (1967)
- Anderson, J.R. Classroom Interaction, Academic Achievement and Creative Performance.
Dissertation Abstracts, Vol.73, No.7 (1973)
- Apeid Sub-Regional Workshop. Continuing Education for Teacher Educators. A report (1979)
- Arnold, D.S. et-al. 1973, "An Investigation of Relationships Among Question Level, Response Level and Lapse Time".
School Science and Mathematics. Vol.73 No.7, 1973
- Ayot, H.O. (1981) : A review of In-Service Teacher Training in Kenya, Vol.1 Kenyatta University College.
- Ayot, H.O. (1981). Approaches to school-based In-service for Effective Teaching. Vol.III. Kenyatta University College
- Ansubel, D.P Learning Theory and classroom Practice
Ontario Institute for Studies in Education. 1967.
- Bennett, N 1979 Focus on Teaching
Longman.
- Biddle B.J and Ellena W.J. (Eds) 1964.
Contemporary Research on Teacher Effectiveness
New York: Holt, Rinehart and Winston.
- Bigala J.C.B. (Ed) ATEA Conference, University of Nairobi
1975. Reports and proceedings
- Bondi, J.C Feedback from Interaction Analysis: Some Implications for the Improvement of Teaching.
The Journal of Teacher Education Vol.XXI No.2 Sam. 1970
- Borich, G.D, 1978, The Appraisal of Teaching: Concepts and process. Addison - Wesley Pub. Co. Reading
- Chasas Sr. V.M. Teacher-Student Verbal Interaction and Critical Thinking Ability
Dissertation Abstracts, Vol.34.2, P660A 1973
- Deighton, L.C. (Ed) The Encyclopedea of Education Vol.2
The McMillan Co. 1971
- Fafunwa, A.B. (Ed) ATEA Conference, University of Ife, 1973
Reports and Proceedings

Flanders, N.A (1970) Analyzing Teaching Behaviour
Addison - Wesley Series, Reading, Massachusetts

Basic Teaching Skills Derived from a model
of speaking and listening .
The Journal of Teacher Education Vol. XXIV, No.1
Spr. 1973

Fieldler, M.L. Bidirectionality of Influence in Classroom
Interaction, Journal of Educational Psychology,
1975 Vol. 67 No.6 PP 735 - 744

Furneaux, D. 1973, Data Analysis.
Open University Press.

Gage, N.L. (Ed) Handbook of Research in Teaching
Chicago, Rand, McNally, 1973

Gilbert, P.G.S Science Education in Africa, University
of Malawi, 1968. Conference Report.

Good, T.L. and Sikes, J.N. Effects of Teacher Sex and Student
Sex on Classroom Interaction.
Journal of Educational Psychology, 1973, Vol.65, No.1
pp 74 - 89 .

Gu-Ming-Yuan Teacher Training in China, Journal of Experimental
Education, Vol.7, No.3 Oct. 1981.

Hakemulder, J.R. UNESCO - UNICEF Project Primary Teacher
Training in Kenya 1973. A report presented
Addis-Ababa, Sept. 1973.

Hough, J.B (1970) Teaching: Description and Analysis
Addison - Wesley Pub. Co. Reading, Massachusetts

Hyman, R.J. Teaching: Vantage Points for Study
New York, Lyppincott, 1968

Kenya, 1978. Report of the National Committee on Educational
Objectives and Policies (WCEOP) P.J. Gachathi,
Chairman. Nairobi, Govt. Printer.

Lancaster, O.E (1974) Effective Teaching and Learning
Gordon and Breach, Science Publishers, Inc.

Lugg, D. (1968) Getting Science Across, Melbourne:
Cheshire

- Martin, M. Concepts of Science Education: A philosophical Analysis, Boston University, 1972.
- Rowe, M.B. Science Education 1973, University of Florida, An International Publication, 1973
- Saadeh, I.Q (1970) Teacher Effectiveness of Classroom Efficiency.
The Journal of Teacher Education, Vol.XXI No.1
Spr. 1970
- Samp, T Observer Effects on Teacher Verbal Behaviour,
Journal of Education Psychology 1976, Vol.68, No.6
PP 736 - 741
- Sifuna, D.N. The Impact of the 'NPA' on the Quality of Teaching in the Primary School of Kenya
M.A Thesis, University of Nairobi, 1973.
- Taylor, L.E "Predicted Role of prospective Activity - centred Vs Text-book Centred Elementary Science Teachers",
Dissertation Abstracts, Vol. 34.5, P 3179A, 1973
- Tuckman, B.W. Conducting Educational Research
Harcourt Brace Inc., New York 1972.
- Romey, W.D (1968) Inquiry Techniques for Teaching Science
Prentice - Hall Inc., New Jersey.