

TEACHERS' PERCEPTIONS OF THE CONTRIBUTIONS
OF THE GIYANI SCIENCE CENTRE.

BY

M.T. BANDI

RESEARCH ESSAY

SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE

MAGISTER EDUCATIONIS

IN

TEACHER EDUCATION
OF
JOHANNESBURG
IN THE

FACULTY OF EDUCATION AND NURSING

AT THE

RAND AFRIKAANS UNIVERSITY

SUPERVISOR: DR. M.C. VAN LOGGERENBERG

NOVEMBER 1999

ACKNOWLEDGEMENTS

I would like to pay special tribute to the following people:

My supervisor, Dr. Marina Van Loggerenberg, for having influenced my thinking and confirmed as valid many concepts I originally held. And also for her ever-willingness to read the copy and offer helpful criticism and encouragement.

Mr Mbhalati for providing me with some documents about the Science Centre, as well as being such a frank and open informant himself.

Science teachers from the six high schools in Giyani, who willingly participated in the interviews for the study.

My classmates, the Teacher Education Masters students, for sharing with me their experience.

My parents, three brothers, one sister and two sisters-in law, for their spiritual and material support. And also their patience with my mental and physical preoccupation during the years of my studies. To all these people I personally owe tremendous gratitude.

And last but certainly not least, special thanks to my editor and brother, Dennis, whose special touch to my work makes it so much more readable.

ABSTRACT

South Africa is undergoing a process of transformation. Thus educators should be alert, ready to face challenges and to keep abreast with developments in education as a whole. This underscores the role of in-service training (INSET) to maintain and improve the quality of education. Success of an innovation depends on the support it gets from the people affected. Similarly, success of the INSET will depend on the support it gets from teachers. Therefore, teachers' perceptions of the contributions of the INSET in their area is of vital importance as it will help form an opinion about the potential of the success of this INSET centre.

Set within the qualitative framework, the research is a case study of Giyani Science Centre. The aim is to identify teachers' perceptions of the contributions of the Giyani Science Centre as well as seeking teachers' suggestions for solving the problem of teachers' resistance to the INSET.

Six high schools from the Giyani region have been selected for participation in the interviews. Two of these schools are Giyani Science Centre's major schools and the other four are non-major schools.

The findings revealed a gap between what was intended and what is happening in practice. The interviewees suggested a need of two-way communication between the Science Centre and the teachers affected, an active involvement of all the teachers at all stages, all types of evaluation to be exercised, use of consultants and also stimuli like salary increment or certificates from the government.

OPSOMMING

Suid-Afrika ondergaan tans 'n proses van transformasie. Daarom moet opvoeders wakker wees, gereed om die uitdagings te aanvaar, en voor te bly met die ontwikkelings in die onderwys as geheel betref. Dit beklemtoon die rol van indiens-opleiding (INSET) om die kwaliteit van onderwys te behou en verbeter.

Die sukses van 'n onderneming hang af van die ondersteuning van die mense wat daarby betrokke is. Net so sal die sukses van indiens-opleiding afhang van die ondersteuning wat dit kry van die onderwysers. Derhalwe is die persepsies van die onderwysers aangaande die bydrae van indiens-opleidings-pogings in hul omgewing, van die uiterste belang, aangesien dit sal help om 'n idee te vorm van die moontlikhede van sukses van enige indiens-opleidingsentrum.

Hierdie navorsing is gedoen binne 'n kwalitatiewe raamwerk as 'n gevalle studie van die Giyani Science Centre. Die doel is om vas te stel wat die onderwysers se persepsies is van die bydrae van die Giyani Science Centre, asook om aanbevelings te vind vir die oplossing van probleme in verband met weerstand van onderwysers teenoor indiens-opleiding.

Ses sekondêre skole uit die Giyani streek is geselekteer vir deelname aan die onderhoude. Twee van skole is hoofdeelnemers aan die Giyani Science Centre se opleiding en die ander vier skole is nie hoofdeelnemers nie.

Die bevindinge toon 'n gaping tussen dit wat veronderstel was om te gebeur en dit wat in werklikheid in die praktyk plaasvind. Die onderhoude suggereer 'n behoefte aan 'n tweerigting kommunikasie tussen die Science Centre en die betrokke (wetenskap) onderwysers, 'n aktiewe deelname van al die onderwysers te alle tye, die gebruik van alle tipes van assessering en evaluering, die gebruik van konsultante, asook selfs beloningsinsentiewe soos salarieverhogings of sertifikate van die regering.

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENT	i
ABSTRACT/OPSOMMING	ii
LIST OF TABLES	vi
LIST OF DIAGRAMS	vi
SECTION ONE	
1. BACKGROUND TO THE ESTABLISHMENT OF THE GIYANI SCIENCE CENTRE	1
1.1. Context	1
1.2. Evaluation of Science education system and results	1
1.3. Rationale	4
1.4. Research problem	5
1.4.1. The obvious problem questions	5
1.4.2. Aims of the study	6
1.5. Claim	6
1.6. Methodology	7
1.6.1. Sample/Population	7
1.6.2. Data collection techniques	7
1.6.2.1. Interviews	7
1.6.2.2. Document analysis	7
1.7. The Study plan	8
1.8. Conclusion	8
SECTION 2	
2. LITERATURE REVIEW	
2.1. Introduction	9
2.2. Role of the Science Centre	9
2.3. Needs and experiential knowledge of participants	10

2.4. Accessibility of INSET and incentives	11
2.5. Use of consultants	13
2.6. Teacher participation	14
2.7. Continuing evaluation	15
2.7.1. Pre-Test	15
2.7.2. Post-Test	15
2.7.1. Characteristics of a supervisor	16
2.8. Conclusion	16

SECTION THREE

3. METHODOLOGY

3.1. Introduction	17
3.2. Setting of inquiry	17
3.3. Research Plan	17
3.4. Sampling procedure	18
3.5. Data collection techniques	19
3.5.1. Interviews	19
3.5.2. Document analysis	20
3.6. Data analysis	20
3.7. Piloting the study	23
3.8. Assuring confidentiality	23
3.9. Reliability and validity	23
3.10. Limitations	25
3.11. Writing research report	25
3.12. Conclusion	25

SECTION FOUR

4. FINDINGS

4.1. Introduction	26
4.2. Establishment and the idea of the Giyani Science Centre	26
4.3. Interview findings in relation to teachers' perceptions to the contributions of the Giyani Science Centre	
4.3.1. Contributions to the community	27
4.3.2. Linkage structures	30
4.3.3. Teacher participation	32
4.3.4. Use of consultants	32
4.3.5. Continuous evaluation	33

4.3.6. Incentives	33
4.4. Policy implications for In-service training for the 21 st century	34
4.5. Conclusion	34
4.6. Bibliography	36

APPENDICES

LIST OF TABLES

Table 1. Subject popularities from std. 8 to 10	2
Table 2. Physical Science passes by year	3
Table 3. Mathematics passes by year	3
Table 4. Matrix Table for clustering data	21
Table 5. Background attributes of the six high schools	22

LIST OF DIAGRAMS

Diagram 1. Triangulation Diagram	24
----------------------------------	----



UNIVERSITY
OF
JOHANNESBURG

SECTION ONE

BACKGROUND TO THE ESTABLISHMENT OF THE GIYANI SCIENCE CENTRE

1.1 CONTEXT

The Giyani Science Centre is located in Giyani region 4 (Northern Province) in the former Gazankulu Government. It is a relatively young in-service training (INSET) programme having been conceived in 1987, constructed in 1988, with funds from the former Gazankulu Government and South African Department of Development Aid, and it was opened in July 1989. It was allegedly the brainchild of Dr. A.W. Pell from Britain who was appointed on a temporary basis as a founder science education consultant, after the former chief minister of Gazankulu and the Government saw a more accurate need for improving science education. Pell (1987:6) gives a summary that the former Gazankulu Government "... has a defined role for education within the state, which is to satisfy national needs for technologically competent people, especially in science and mathematics."

1.2 EVALUATION OF SCIENCE EDUCATION SYSTEM AND RESULTS

From February to April 1987, Dr. A.W. Pell conducted research in the former Gazankulu government, aiming at identifying:

- " The degree to which the current school system was satisfying the national objectives relating to qualified science pupil output;
- how the output from schools had changed over a period of five years;
- how the output of black education generally compared with that of Gazankulu
- how the schools taught science to pupils from standards six (6) to ten (10);
- how well equipped were the schools for teaching science;
- How well-qualified were the teachers employed in the teaching of science..." (Pell, 1986).

As a result Physical Science was found to be a subject of low order preference, especially when students are given chance to select the subjects (see Table 1) whereas Tsonga, English, Afrikaans, Biology and Mathematics were of high order preference, as they were compulsory.

TABLE 1: Subject popularities from std. 8 to 10

Subject	Relative Popularity
Tsonga	5.0
English	5.0
Afrikaans	5.0
Biology	5.0
Mathematics	5.0
Agricultural science	3.3
Biblical studies	2.4
History	1.6
Geography	1.4
Physical science	1.0
Accounting	0.4

Several minority subjects score below 0.4 and are omitted

Source: DET statistics 1986: Gazankulu.

Looking at the Department of Education statistics, in 1986 there was a reduction in the number of pupils who passed Mathematics and Physical Science compared to previous years (see Tables 2 & 3).

TABLE 2: Physical Science passes by year.

NUMBER OF PUPILS			
Year	Writing std.10 Exams	Writing std.10 Physical Science	Achieving Grade E or above in Physical Science
1981	2125	792	142
1982	2266	807	156
1983	2977	640	133
1984	3374	527	133
1985	4418	572	187
1986	4952	697	162

Source: Report on science education in Gazankulu (1987)

TABLE 3: Mathematics passes by year

NUMBER OF PUPILS			
Year	Writing std. 10 Exams	Writing std.10 Biology	Achieving Grade E or above in Biology
1981	2125	2096	931
1982	2266	2167	1125
1983	2977	2951	1418
1984	3374	3296	1632
1985	4418	4111	1535
1986	4952	4772	1237

Source: Report on science education in Gazankulu (1987)

This has shown that the former Gazankulu Government was unable to accomplish its aims because of the low pass rate in Physical Science and Mathematics. Most black teachers were trained in institutions whose theoretical discourse is fundamental pedagogics, and they are teaching the pupils in the same way as they have been taught. Enslin (1990) says that in positioning itself as science, the discourse provided little illumination of the apartheid, social and educational order. In this regard it left many teachers ill equipped. Pell (1987:10) says that “... it is from this minute base that the Gazankulu Government is attempting to construct a technological future.” He continues saying “...Gazankulu will have to generate its own solution.”

To solve the problem, Pell (1987) made some recommendations, some of them being that:

- “ The Education Department should nominate one school in each of its circuits as a major school at which Science resources will be concentrated...”
(Recommendation 19:28)
- “ The Education Department should establish, as a matter of priority, the Giyani Science...it will be the focal of all the Science educational activities in Gazankulu, providing:
 - o Winter schools for Science teachers and pupils,
 - o A weekly std ten(10) science course for all Science teachers,
 - o A study and advice centre for all Science teachers,
 - o Adult education programmes in Science and technology.” (Recommendation 20:28)

Indeed, in July 1989 the Giyani Science Centre started to function. A year later the sister centre was opened in Thulamahashe, also in the former Gazankulu Government. Already an indication of improvement in Science education could be seen. In 1994 Pell’s contract expired and could not be renewed because of some political reasons.

1.3 RATIONALE

The recent political, social and economic changes have brought about rapid changes on the educational scene in South Africa. Today educational policies emphasise the teaching of science and technology. They also encourage students to be critical and demonstrate the results of their learning. In the past, however, most teachers were trained within the rigid theoretical discourse of fundamental

pedagogics, which did not encourage students to be critical but to accept authority as given. Clearly therefore, it is of vital importance that all teachers, teachers in training, administrators and educational policy-makers be informed about these changes. This underscores the role of in-service training (INSET). In the Northern Province, INSET is even more important considering that the matriculation results have been the lowest of all for the past three years. In this regard INSET may be employed to maintain and improve the quality of education and lead to the reduction of educational equality between this province and the other provinces.

INSET strategies for the improvement of the quality of education are likely to succeed to the extent that they are supported by teachers as the users. Therefore the teachers' views about a particular INSET programme are vital. Based on this assumption I intend to explore the perceptions of the Giyani teachers on the INSET centre in their area, the Giyani Science Centre. This will help to form an opinion about the potential success of this INSET centre. Obviously there are other factors that need to be considered for an INSET programme to succeed. However, these factors are beyond the scope of this study. The study only focuses on the dimension of teacher support.

1.4 RESEARCH PROBLEM

This study intends to investigate teachers' perceptions to the contributions of the Giyani Science Centre in the upliftment of education in the area. To my mind it is a serious problem if increasing resistance is encountered, because as technological developments pose new challenges day by day, there is a danger that teachers may be unable to cope adequately with these demands. Failure to cope with these will produce ineffectiveness on the side of teachers and a high failure rate on the side of students.

1.4.1 THE OBVIOUS PROBLEM QUESTIONS

- What are teachers' perceptions of the contributions of the Giyani Science Centre?
- Do the perceptions of teachers from the six schools differ?
- Does the constructivist approach lead to effective replacement of the old way of teaching Science with scientifically correct ones among teachers?
- What are teachers' suggestions for solving the problem of teachers' resistance?

1.4.2 AIMS OF THE STUDY

- To identify teachers' perceptions of the contributions of the Giyani Science Centre.
- To establish whether teachers from the six schools differ in their perceptions regarding the contributions of the Giyani Science Centre.
- To investigate the effectiveness of the constructivist approach in replacing the old way of teaching Science with scientifically correct ways.
- To seek teachers' suggestions for solving the problem of teachers' resistance to the INSET.

1.5 CLAIM

My claim is that the few teachers that understand the aims and importance of INSET have a positive attitude towards it, but increasing resistance is encountered because teachers are not aware of these aims and the importance thereof. Some do not believe in what is being taught ever since Dr. A.W. Pell left. Teachers are also expected to use their time and money without any compensation. Success of an innovation depends on the support it gets from the people affected; similarly, the success of the Giyani Science Centre will depend on the support it gets from teachers. Both new and experienced teachers should be helped to see the aims and importance of INSET. Supervisors should consider teachers' needs and also conduct continuous follow-up evaluations to see whether teachers are using what they have learnt through INSET. To secure teachers' participation, stimuli like release time and salary increments are to be considered by the Government.

INSET strategies for the improvement of the quality of education are likely to succeed to the extent that they are supported by teachers as users. Ashley (1987:48) states that: "Their perceived needs as well as their expressed wants are likely to enhance programme effectiveness if attended to." Teachers should be given responsibilities and afforded involvement at every stage and level. Ashley (1987:48) continues to say that teachers also need to take responsibility other than listening, for the process of designing and running these seminars. Ultimately it is them who will implement what has been learnt in the INSET. If they do not believe in what is learnt they will not implement it, moreover, they may not even feel willing to attend the programmes. Oliva (1990) says that: "To gain teachers' participation in organised in-service training, some incentives are

essential...release time, salary increments based on the accumulation of in-service credits, and in-service activities without cost to teachers.”

1.6 METHODOLOGY

1.6.1 SAMPLE/POPULATION

The study will use fifteen (15) participants, three staff members from the centre, a group of grade ten (10) and twelve (12) teachers who will be drawn equally from the six high schools in Giyani. Only one teacher per grade per school is to be used.

1.6.2 DATA COLLECTION TECHNIQUES

The main data gathering techniques to be used are interviews and document analysis. I will also rely remotely on informal observation.

1.6.2.1 INTERVIEWS

Interviews will last for an average of forty-five (45) minutes and will be conducted individually, to allow individuals to state their views as freely as possible. All the interviews will be tape recorded while I will be taking notes during the process.

1.6.2.2 DOCUMENT ANALYSIS

Documents to be studied are primarily those outlining the structures and procedures of the Giyani Science Centre. Amongst other things, documentary evidence will be studied in order to show how the Centre is operating and who participates in INSET. Apart from these documents, an effort will be made to study the invitation letters (circulars), roll-call list of teachers who attended INSET in the years 1998 and 1999.

1.7 THE STUDY PLAN

This research is structured into four sections. The first section provides a brief history of the Giyani Science Centre, tracing the circumstances leading to the establishment of these INSET incentives. Section two gives a critical review of literature on which the study is based and a conceptual framework in which to locate an understanding of INSET. The third section outlines the methodology used in gathering information for the study. The methodology used is grounded within the framework of qualitative research with the main data gathering techniques being interviews and document analysis. The last section will provide an analysis of the results and a discussion of interview and documentary evidence of the specific issues this study is purported to ascertain, also examines policy implications of the study and drawing up of a conclusion.

1.8 CONCLUSION

If there is no rapid upgrading of teachers to cope with new challenges, new values of education may not be attained. Consequently there may be no possibility of adequate utility and the aims and values of Education will therefore be defeated. This underscores the role of in-service training. Therefore the perceptions of the Giyani teachers on the INSET centre in their area is of vital importance as this will help form an opinion about the potential of the success of this INSET centre.

SECTION TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This section will discuss the critical issues of staff motivation and professional pride as bases for any attempt at improving the quality of teachers through INSET. The section is subdivided into:

- Role of teachers' centre
- Needs and experiential knowledge of participants
- Accessibility of INSET programme
- Use of consultants
- Teacher participation
- Continuing evaluation
- Conclusion

2.2 ROLE OF THE TEACHERS' CENTRE



Technological developments have interfered with effective teaching, only the motivated and technologically oriented faculty is seemingly consistent in the use of new instructional technologies. The numerous instructional technologies available for the faculty require particular ways of representing knowledge. This underscores the role of the teachers' centre. According to Thembela (in Ashley & Mehl, 1987:56):

“A teachers' centre may be defined as an institution which is geared to respond to and satisfy the professional needs of teachers in the area in which it is located.”

The goal of the teachers' centre is the continuous professional development of the teachers, which in turn will enhance the achievement of the learners. However, for a teachers' centre to have any real impact in the social, economic, political and educational circumstances of South Africa, it must be part of a wider initiative to bring improvements on:

- “ the condition under which the teacher works;
- the provision of education more generally; and
- the total socio-economic, and political dispensation of South Africa”(Van den Berg, 1983:4).

The teachers’ centre must also satisfy criteria that are applicable to all teachers’ centres. The Giyani Science Centre, like the other Science Centres, has to satisfy the mission set by the South African Association of Science and Technology Centres (SAASTEC).

It has been indicated that students and teachers exhibit persistent conceptions contrary to the prevailing scientific concepts (Thijs & Van den Berg, 1995; Driver et al, 1985). Stanton (1989:59) states that the modern trends in Physics teaching are geared towards the replacement of contrary conceptions with scientifically correct ideas. These modern trends has generally attracted various areas of Physics; in Mechanics and matter concepts (Driver et al, 1985; Thijs, & Van den Berg, 1985), and in Electricity and Optics (Bouwence & Verkerk, 1988; Stanton, 1989; Thijs & Van den Berg, 1985).

Teachers’ centres may be employed to maintain and improve the quality of education. This will help the teachers to change from the old way of thinking about the teaching, where they think they are the truth tellers, they think one explanation is enough for understanding, to the new way of thinking where students will be actively involved.

2.3 NEEDS AND EXPERIENTIAL KNOWLEDGE OF PARTICIPANTS

According to Havelock’s problem solving model, Van den Berg (in Ashley & Mehl, 1987:17) says “ The ownership resides in the users, who identify and diagnose the need, proceed with innovation and development: outsiders become involved on the basis of terms laid by the users themselves.” Therefore, in-service education programs should be planned and carried out in cooperation with those for whom the programs are designed. The planning should begin with the assessment of needs as perceived by the teachers, because teachers have first hand knowledge of the difficulties which their students’ experience in various areas. Leoned (1982:63) says that:

“ In-service education programs should be grounded in the needs and interests of the persons to be served.”

The needs and wants may be identified in number of ways, for example, evaluation of teachers’ work by the principal, studying tests and examinations, as well as pupils’

performance. It also seems essential to find out from teachers themselves what their wants and needs are. Their perceived and expressed wants are likely to enhance the program effectiveness if attended to. Once the teachers' choices are known, these must be ranked in order of preferred priorities. From that point a plan must be drawn up that will indicate which of the top needs will be addressed and how. In-service training programs should provide practical expression of the notion of teacher education, not as a terminal process (after one has obtained a certificate) but as a continuation of pre-service. What is learnt in the pre-service training should serve as a prior knowledge.

Strategic learners use existing knowledge to help learn new things. It can be more difficult to learn an introductory course for the first time than studying an advance course in the same area. What the learner already knows can strengthen new learning by governing meaningful relation to new information. Therefore, in-service training programs should start where the learner is, instead of where it is, because what one already knows exerts a powerful influence on what s/he is about to learn. Hartshorne (1982:12) says that: "... if a new spirit and approach is to be achieved in education, urgent and immediate attention should be given to the position of the teacher: his academic background, his professional training, his further development during his teaching career, the condition under which he works...".

The learners prior-knowledge needs to be rewarded and encouraged so that it forms the basis for new discovery processes and the learner has to be given the pivotal role in controlling learning, being supported in constructing knowledge rather than reproducing it in a behaviorist fashion. Piaget, termed a constructivist, proposed that learners learn by proposal constructing their own knowledge. Construction involves each learner making a decision to learn and thereby opening themselves up to new knowledge and experiences.

The construction process progresses through the learner accepting or taking new knowledge, this is termed assimilation. If the knowledge naturally builds on pre-knowledge then the learner accommodates the new learning. Through assimilation, accommodating and adapting of knowledge the learner is constantly reassessing his/her learning by checking its validity. If knowledge is valid for the learner it is retained, if it is invalid it is rejected.

2.4 ACCESSIBILITY OF INSET PROGRAMMES AND INCENTIVES

Themabela (in Ashley & Mehl, 1987:53) says: " Many In-service training programmes are usually held somewhere (university, hotel, college) away from the teachers' own setting." This creates an atmosphere of artificiality and remoteness. Teachers will find it difficult

to relate what they learn in those areas to their own natural environment. During their first hours they will pay attention to the geographic setting of such a place. The best physical setting for conducting in-service training programmes is the teachers' own setting, just like the Giyani Science Centre located in Giyani which is serving all teachers and pupils in the area.

Looking at the resources and facilities care must be taken to create conditions and provide them with the education system that will promote teacher growth. Ngcongco (in Ashley & Mehl, 1987:13) says: "An INSET which wants to create an environment for its teachers should have appropriate resources and facilities for carrying out various teaching tasks." INSET entrepreneurs/organisers should make sure that what they offer must be good and relevant for teachers so for teachers to be certain to embrace the innovation with open arms. Pavlich (in Ashley & Mehl, 1987:87) says ... that the programme should ensure a sound and economic use of resources to facilitate the realisation of the core elements." These core elements were identified as:

- "The INSET program should be based on a needs and priorities analysis and directed to a priority target group.
- The program should contain clear statements of objectives which describe what the programme is designed to achieve.
- The program should be school focused. The school rather than the individual.
- The program should be learner-centered and democratic. A top-down approach must be avoided."

Mehl (1987:30) also says: "The model of in-service education for teachers in South Africa revolves around the provision of a learning environment which is essentially compensatory." Today's school systems are encountering increasing resistance from organised teachers' unions to demand on their time without any compensation. Teachers need to be motivated by whatever possible means so to participate in in-service training Oliva (1992:336) says that: "The school system must establish incentives for teachers to participate in organized in-service activities. Personal satisfaction and professional improvement are not sufficient incentives by themselves."

Unless there are other stimuli i.e. salary increments, financial support etc. to induce teachers to study on their own time, a fundamental principle for in-service activities sponsored by the local school system is the provision of time for the teachers at the expense of the school system.

2.5. USE OF CONSULTANTS

Eraut (in Williams, 1991; 141) says that: “A consultant is any external agent from within the educational system who involves himself in discussing the educational problems of a class, department or school with a view to improving the quality of teaching and learning.” For in-service training where teachers settle down to find specific answers to immediate problems or to learn new techniques for accomplishing their instructional duties, the purely informational types of consultants will usually not suffice. Teachers need the services of an outside expert who will lead them through the study they are undertaking and remain with them long enough to permit them to begin discovering answers to their many question and problems.

As a consultant should be an outsider, care must be exercised in the employment of such a consultant and the uses that are made of their services. Oliva (1993:638-369) draws a few simple rules a supervisor should consider when planning for the use of outside consultants:

- The consultants chosen should be qualified beyond question for the rules asked of them. The supervisor should do some advance checking, preferably with school systems that have called on the consultants’ services in the past, to be sure that the consultants chosen are the best qualified persons to be obtained.
- The consultants should be oriented well in advance to the task expected of them. The consultants should be available for questions and discussion following their presentations. The consultant who hurries in, makes a presentation, and exits often leaves a group at the very point where some return could be obtained from interaction with him/her. Some consultants have imported things to say. Some share research they have conducted or new techniques they have found helpful. Others give a good pep talk and some are effective at entertaining teacher groups. Keynote speakers at conferences often fill this last bill very well. Some of the more charismatic keynote speakers have the ability to maintain the rapt attention of audiences of a thousand or more.

About the roles of a consultant Euraut (in Williams, 1991: 142) has provided a helpful typology of consultancy roles under eleven headings:

- The expert
- Resource provider

- The promoter
- Career agent
- Link agent
- Inspector/evaluator
- Legitimate
- Ideas man
- Process helper
- Councilor
- Change agent.

Within the Giyani Science Centre the practices discussed above were seen to be very important. The consultant appointed in here was one with a curriculum development background of mathematics and science, and was an outsider from Britain who found life in Giyani for dependants very frustrating.

2.6 TEACHER PARTICIPATION

Hartshorne (in Ashley & Mehl: 1987:10) says that: “INSET must be as democratic and as cooperative as possible, involving teachers actively at every stage and every level.” Participation is seen to have an integrative function in the sense that it is considered to give rise to enhance group harmony and a sense of cooperation and motivation. For this reason, it is seen to aid the understanding of aims and importance of an INSET programme, also seen to be central in bringing about significant changes in human behavior.

Teacher participation for aiding the understanding of aims and importance of an INSET programmes vital. If teachers are given a chance to take part other than listening in the planning or designing at each level, obviously they will have a positive attitude towards it, they will know what they are to achieve at the end and as a result they will teach their students the same way as they have been taught/ trained, they will give students a chance to use their own thinking, searching for information on their own as this can help them to store information for later use. Brophy (1986:1081) says that:

“Students who were able to extract the general concept on their own ...evidence more recall and transfer than those who were simply told the concept.” If pupils are not given time to discover things for themselves, it will be meaningless and sometimes pupils will not be able to give satisfactory answers. INSET is trying to break down the walls between

the classroom and the real world, where the learning content should link to what the learners come across outside the classroom or in real life, also where teachers are given responsibilities of being involved in the system of sharing in the curriculum development, participating in the design and administration of new forms of educational assessment producing materials for learning and teaching so that more pupils in the community share in teaching.

2.7 CONTINUING EVALUATION

To assess the effectiveness of in-service education and to strengthen programmes, continuing evaluation is essential. According to Oliva (1993:369):

“Evaluation of in-service programs can consist of the supervisor’s observation of the participants’ performance during the activity and after... for example, pre-test and post-test.”

2.7.1 PRE-TEST

Oliva (1993:357) says: “ The plan should be developed from an assessment of the needs and interests of the persons to be served.” Teachers’ perceived needs as well as their expressed wants are likely to enhance the programme effectiveness if attended to. If their needs and wants are not considered, they may not believe in it, moreover, they may not even feel willing to attend the programmes. Teachers’ needs and interests may be assessed by evaluation of teachers’ work by the principal, studying tests and examinations, pupil performance, questionnaires, etc.

2.7.2 POST-TEST

Too many evaluations stop when participants fill out reaction forms on conclusion of an in-service programme, nothing is done to check as to whether these trainee – teachers really apply what they’ve learnt in their classrooms. Oliva (1993:369) says: “ what a school system really needs to find out is whether the activity made any difference in teacher performance, that is whether the teachers apply in the classroom the knowledge and skills learned in training.” He continues (1993:375): “supervisors should conduct follow-up evaluation to see whether teachers are using what they have learned in in-service training programmes.” Professional supervisors should evaluate their own performance continuously. The following is an example of a checklist, which can prove helpful in directing a self-appraisal:

2.7.2.1 CHARACTERISTICS OF A SUPERVISOR

- I provide assistance as needed
- I am open to communication
- I show concern to individual teachers
- I transmit pertinent information
- I am receptive to others' ideas
- I interact effectively with teachers
- I communicate clearly
- I provide leadership in curriculum development
- I am up to date with curriculum development
- I am effective as a demonstration teacher
- I am skillful in diagnosing instructional difficulties
- I involve teachers in decision making
- I plan in-service activities in response to teachers' needs
- I perceive my primary role as a helper to teachers

2.8. CONCLUSION

In looking at INSET programmes in relation to teacher effectiveness, it has been argued that it is not just programmes that will raise effectiveness. A conducive working environment, availability of resources etc are some of the factors that might contribute to teacher effectiveness. Consultants, supervisors, school managers and teachers should work hand in hand in sharing the responsibilities of planning and co-ordination programmes.

SECTION THREE

METHODOLOGY

3.1 INTRODUCTION

In this section a clear exposition of the process of the field inquiry is represented. The section starts with the setting of the inquiry. The methodology is located within the framework of qualitative research, which offered valuable insight in relation to the scope and purpose of this study. Findings/transcribed data do not form part of this section but it will appear in detail in the next section.

3.2 SETTING OF INQUIRY

The Giyani Science Centre was established in 1989. The centre is situated in Giyani in the former Gazankulu in the Northern Province. Its role is defined in two ways to the schools in the area:

“...the Centre renders services to Science, Mathematics and Technology teachers...in a way of professional development of teachers.... We have a variety of activities for learners...intend to enrich what they get in schools in terms of the standard of the experience they get from their schools” (Director of the Centre, Interview).

3.3 RESEARCH PLAN

This study was guided by the assumptions underlying mainly the qualitative paradigm (Magagula, 1995). This paradigm made it possible to understand the teachers' views to the contributions of Giyani Science Centre in the upliftment of education in the area, also the role played by the Giyani schools. The study was in the form of case study because the focus was on one INSET programme only. Yin (in Hitchcock & Hughes, 1995:321) identifies three distinct types of case study approaches, namely exploratory, descriptive and explanatory. A descriptive approach was suitable for this study because it intended giving a narrative account on teachers' views regarding the contributions of the Giyani Science Centre in the

upliftment of education also the role-played by the Giyani Science Centre in the area

Cohen (1994) argues that there are valuable insights to be gained from a study of a single rather than unique case, for example, a single case study can give attention to the complexity of a case in its own right. It also seemed appropriate to broadly locate the methodology within the framework of qualitative research, which is widely regarded as particularly suited to a detailed study of an individual unit. According to Cohen & Manion (1991:125) qualitative methods are seen to offer an opportunity to “probe deeply and to analyze intensively the multivarious phenomena” constituting a unit.

In contrast, the qualitative paradigm asserts that reality is mind-dependent, mind constructed, therefore, socially constructed by individuals or groups within the given society. It does not exist independently of the mind, which constructed it in the first neutral set of procedures. The data, which are generated through research, are not free from interpretation by the same mind. Truth is a socially and historically conditioned agreement. Smith (1994) argued that what is judged true or trustworthy is what is agreed upon, conditioned by time and place.

The use of the qualitative paradigm doesn't mean that quantitative research (traditionally identified with the positivistic discourse) was not included; it was also used. Drawing on Cohen & Manion (1991); Popkewitz (1994); & Christie (1990), who note the importance of complementing different approaches and methods. The quantitative methods have been employed in a number of approaches and methods, the quantitative methods have been employed in a number of appropriate isolated cases to establish broad patterns necessary for a holistic understanding of a social world investigated.

3.4 SAMPLING PROCEDURE

The purposive sampling method was used: Firstly, for selecting the schools and secondly for selecting respondents for the study. Patton (1990:169) contends that the logic and power of purposive sampling lies in selecting information-rich cases for an in-depth study. A strategy for purposefully selecting information-rich cases, called “extreme or deviant case sampling” was suitable for this study. This approach focuses on cases that are rich in information because they are unusual or

Special in some way, such as outstanding successes or notable failures: “exotic events and crisis” (Patton, 1990:182). In this study the focus was on six schools which showed notable pass and failure rates in producing matric results for the past three years. Two of the four were the major schools (schools at which science resources are concentrated) of Giyani Science Centre and the other two were non-majors. The study used fifteen (15) participants, three staff members from the teachers’ centre, and a group of twelve (12) teachers who were drawn equally from the six (6) high schools in the area. The choice of more science teachers were made due to the realisation that the perceptions being studied are of them which will help to form an opinion about the potential of the success of the INSET in their area.

3.5 DATA COLLECTION TECHNIQUES

The main data gathering techniques used in the study are document analysis and interviews. In the following section interviews and documentary analysis are discussed.

3.5.1 INTERVIEWS

The interviews used are what Hitchcock & Hughes (1989) would typify semi-structured interviews, which are much more flexible than the structured interview. (See Appendix C for the interview schedule). In keeping with the qualitative rationale of this study, the goal of semi-structured interviews is to allow “depth to be achieved by providing the opportunity to probe and expand the interviewee’s responses” (Hitchcock & Hughes, 1989:83). The nature of the interview chosen enabled the interviewees to use their own words and interpretations with little or no influence from my concepts because of the open-ended interview question used i.e. “Describe the role that the Giyani Science Centre plays in your school.”

The interview was conducted on an individual basis. This enabled every respondent to be free to voice his/her views without fear of others, also to be unintimidated by their colleagues. Because of the unavailability of time and/or for the reason of not interrupting the lessons, the interviews with some of the teachers were done during the October school holidays. Some teachers were interviewed after the holidays but appointments were made to meet them at their places on their own time. Interviews with teachers who couldn’t make it during the holidays were conducted on the 13th of October during the school hours. With the permission of the teachers a micro tape recorder was used. I also took notes during the process. The interview with the

Director of the teachers' centre was done on the 12th of October 1999 in the afternoon. The interview ran for an average of 45 minutes per interviewee. At the end of the interview the Director of the Centre was asked to supply me with the documents that might shed light on the subject.

3.5.2 DOCUMENT ANALYSIS

According to Eisner (1991:184), "... documents are an important source of data especially because they frequently reveal what people will not or cannot say." Bandi (1995:59) says that: "The document analysis started in 1993" and is still used to date. The documents studied are those outlining the structures and procedures of the INSET. Amongst other things, documentary evidence was studied in order to show how the INSET is operating and to show the participants in the INSET. The following documents were seen to be of relevance in this regard:

1. Giyani Science Centre's mission
2. The Centre's policy
3. Invitation letters/circulars
4. Attendance register



3.6 DATA ANALYSIS

Data analysis involves the process of categorising, coding, clustering and consolidation of data. After the collection of data, I coded the data. The aim of the coding stage is to summarise sensitively and sort the data into appropriate categories. Therefore the data was analysed. The categories were prioritised and the relationship between categories was examined to depict more accurately the underlying situations. On the basis of this analysis, interpretations were made and the meanings of the different aspects were made. An example showing the matrix table used to cluster data appear in Table 4 where all categories were identified. Details of the findings/interviews are not given but will appear in detail in section four.

TABLE 4: MATRIX TABLE FOR CLUSTERING DATA

SCHOOLS	EDUCATORS	CATEGORY	CATEGORY	CATEGORY	CATEGORY	CATEGORY
		1. R.	2. L.S.	3. T.P.	4. C.E.	5. I.
A	Educator 1.	Past-satisfactory Present-not	Past-yes Present-no	Past-partially Present-no	Past-needs only Present-no	Past-yes Present-no
	Educator 2.	Past-satisfactory Present-partially	Past-no Present-no	Past-no Present-no	Past-no Present-no	Present-no
B	Educator 1.	Past-excellent Present-not	Past-not sure Present-no	Past-no Present-no	Past-yes Present-yes	Past-yes Present-no
	Educator 2.	Past-satisfactory Present-changed	Past-no Present-no	Past-no Present-no	Past-no Present-no	Past-yes Present-yes
C	Educator 1.	Past-not sure Present-not good	Past-not sure Present-no	Past-no Present-no	Past-no Present-no	Past-not sure Present-not sure
	Educator 2.	Past-satisfactory Present-not at all	Past-no Present-yes	Past-no Present-no	Past-no Present-no	Past-yes Present-no
D	Educator 1.	Past-authoritative Present-changed	Past-partially Present-yes	Past-during Workshop Present-no	Past-No Present-no	Past-yes Present-no
	Educator 2.	Past-not sure Present-good	Past-no Present-no	Past-no Present-no	Past-needs only Present-needs only	Past-yes Present-no
E	Educator 1.	Past-not sure Present-no	Past-not sure Present-no	Past-not sure Present-no idea	Past-no idea Present-no	Past-no idea Present-no
	Educator 2.	Present-excellent Present-no	Past-yes Present-no	Past -during Present-workshop	Past -needs Present -only	Past-no Present-no
F	Educator 1.	No knowledge of past and present	No idea of The centre	Lack knowledge Of the centre	Lack knowledge	Know nothing
	Educator 2.	Past-excellent Present-not	Past-yes Present-no	Past-yes Present-no	Past-yes Present-no	Past-yes Present-no

KEY:

CATEGORIES

- 1. R -Role of Giyani Science Centre
- 2. L.S. -Linkage structure
- 3. T.P. -Teacher participation
- 4. C.E. -Continuous evaluation
- 5. I -Incentives

An attempt was made to include a cross section of participants in terms of gender and experience, with the idea of getting as diverse information as possible (see

Table 5). Table 5 shows the background attributes of the six high schools. As the table indicates, of the six schools, two were Science Centre's major schools with boarding facilities and four were non-major schools. From all schools two educators were interviewed where one educator from the two major schools was a principal. Educators were relatively experienced as teachers and administrators. For example, the minimum and maximum teaching experience of the twelve teachers was three (3) years and twenty-one (21) years respectively. Coming to the issue of gender, only two female teachers were interviewed from the four non-major schools, one from each.

TABLE 5: Background attributes of the six high schools.

SCHOOL	TYPE	NO OF EDUCATORS	GENDER		TEACHING EXPERIENCE		LEVEL OF SENIORITY
			F	M	T	YRS	
A	M	2		2	A	11	T
					B	23	P
B	M	2		2	A	9	T
					B	11	T
C	NM	2	1	1	A	13	H
					B	8	T
D	NM	2	1	1	A	10	T
					B	8	T
E	NM	2		2	A	3	T
					B	6	T
F	NM	2		2	A	11	H
					B	3	T

KEY:

- | | | | |
|--------|--------------------|----------|--------------------|
| 1. M - | Major school | 5. T - | Teacher |
| 2. NM- | None –major school | 6. YRS - | Years |
| 3. F - | Female | 7. H - | Head of department |
| 4. M - | Male | 8. P - | Principal |

3.7 PILOTING THE STUDY

Before the real schedule, a pilot study was done using three science teachers from the non-targeted schools in the area, so to test the strengths and weaknesses of the interview schedule. Two weaknesses were identified being that:

- Firstly the questioning was not arranged properly as some of the questions at the end needed the same information as asked in the beginning, so I was forced to rearrange the questioning.
- Secondly my request to see the teachers was held with suspicion because by the time of writing this research essay I was a freelancer at Munghana Lonene radio station, so teachers thought that the information was needed to be broadcast over the radio.

One teacher proved difficult to get, and the other two managed to meet me for an interview. Though I encouraged them to express their views and also their feelings as honestly as possible they tried to impress me.

3.8 ASSURING CONFIDENTIALITY

Burgess (in Bandi, 1995:65) argues that the concept of confidentiality has an important function in the social process of building up the appropriate relationships for open, honest discussion. This has proved to be the case in this study. Assurance of confidentiality beforehand when making appointments made teachers from targeted schools to be able to avail themselves for an interview also to be tape-recorded. I also assured them that I am not going to use their names but pseudonyms would be used in the research report in order to protect the identity of individuals.

3.9. RELIABILITY AND VALIDITY

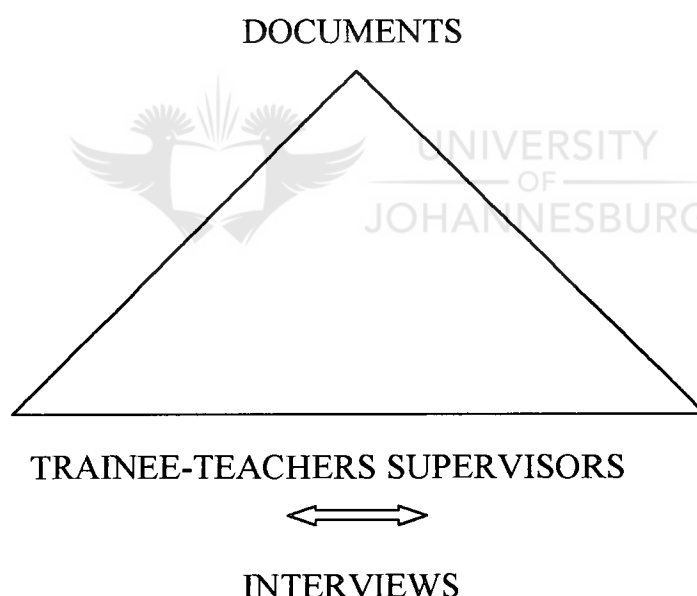
On the issue of reliability of information provided by informants, Cohen & Manion (1989:318), drawing on studies reported by Cannell & Kahn (1968) indicates how subjects may provide a misleading picture of a situation. Therefore,

in social research, it is important to employ the procedure of triangulation to provide numerous verbatim interview data. Hitchcock & Hughes (1995:324) define triangulation as one of the strategies for increasing internal validity in case studies. There are four types of triangulation used in research namely: “ data triangulation, investigator triangulation, theory triangulation and methodological triangulation” (Denzin,1970:313); cross sectional triangulation (Cohen and Manion,1989).

Cross-sectional triangulation is the one used in this study. Bandi (1995:64-65) says “ cross-sectional time triangulation refers to the collection of data concerned with time related processes from the different groups at one point in time.” This type of triangulation was used as data collection techniques such as document analysis, interviews with Giyani Science Centre staff; trainee-teachers and more remotely informal observations were involved.

Diagrammatically, triangulation as described above is as follows:

Diagram 1: Triangulation



In addition to these efforts, other strategies were employed to address reliability and validity. These include asking the same questions differently to the same people to check if the information provided is consistent; creating a relaxed atmosphere for people to feel free to talk; discussing transcribed data with participants and, above all, striving to think reflexively, throughout the research

process. The detailing of the methodology as provided here will help readers to assess the validity and reliability of the research findings and descriptions.

3.10 LIMITATIONS

It was my intention in this study to include the founder Science education consultant of the Giyani Science Centre as the third informant from the management side but it couldn't work as his contract expired in 1994. One of the documents reviewed was not originally intended for research purposes (research document by Dr A.W. Pell). It was impossible to interview Dr. A.W. Pell (who is the author of such a document and also the founder consultant of the centre) to check validity since he left for abroad. These weaknesses might have affected the quality of information from the management side.

3.11 WRITING THE RESEARCH REPORT

The research findings are represented in details in the next last section. Not all the parts of the findings are written, certain parts of the findings became redundant and were excluded from this report. During the process, units of general meaning were noted and then reduced and clustered together into units of meaning relevant to the research question (Cohen & Manion, in Bandi, 1995:69).

3.12 CONCLUSION

A qualitative research approach was used because it offered an integrated perspective. A descriptive survey research method was used to collect data through open-ended interviews with eyewitness account of events. In addition documents were also analysed using the procedure for analysing qualitative data (Bogdon & Biklein, 1982; Taylor & Bogdon, 1984; Miles & Huberman, 1984). The approach used will help readers to understand the next chapter of the findings with ease.

SECTION 4

FINDINGS

4.1 INTRODUCTION

This chapter is about the findings and implications of the investigation done through interviews and document analysis. The main aim of this study as indicated in section one of this research essay is to investigate teachers' perceptions of the contributions of the Giyani Science Centre. The section starts with the establishment of the Giyani Science Centre and its intentions. Information given in this part is drawn mainly from the documents studied. Interviews are also used to either support what the documents outline or to point out the areas of contradiction.

This section also presents a detailed outline of the interview findings in relation to teachers' perceptions to the contributions of Giyani Science Centre in the upliftment of education in the area. Observations and documents are also used to be in support of what the interview outline. This section moves back and forth between the past and the present. The following categories were revealed by data analysis:

- Contributions
- Linkage structure
- Teacher participation
- Consultation
- Continuous evaluation
- Incentives

4.2 ESTABLISHMENT AND THE IDEA OF THE GIYANI SCIENCE CENTRE

Giyani Science Centre, the brainchild of Dr. A.W. Pell was established in 1989 for achieving the objectives drawn from the document studied (see 1.2 paragraph 2, also appendix E:2).

According to the objectives drawn, the service of this Science Centre can be described as an institution, which is geared to respond to and satisfy the professional needs of teachers and learners in the area. In other words, it is a centre where teachers meet regularly and informally to test, display and discuss their own work. It is a centre for professional interchange of information, ideas and innovation. It provides practical expression of the notion of teacher education not as a terminal process but as a continuation of pre-service and in-service training. Similarly, the Director of the centre described its service in two ways, namely to teachers and learners; the following is what the Director said:

“ The centre renders services to teachers, Science, Mathematics and Technology teachers. It renders service in the way of professional development of teachers ...serves as a resource centre...we have a variety of activities for learners, but generally we call their activities enrichment programmes...in terms of standard of the experience they get from their teachers...”

The Giyani Science Centre like the other centres has been established to satisfy the mission set by the South African Association of Science and Technology (SAASTEC). “The mission is to develop and enhance science, Mathematics and Technology education in response to the social expectation of the majority of South Africa....



4.3. INTERVIEW FINDINGS IN RELATION TO THE TEACHERS’ PERCEPTION OF THE CONTRIBUTIONS OF GIYANI SCIENCE CENTRE.

4.3.1 DOES THE SCIENCE CENTRE CONTRIBUTE TO THE GIYANI COMMUNITY?

Teachers were asked to describe the role that the Giyani Science Centre plays in schools (see Appendix C). The responses move back and forth between the past and present. It was indicated in Sections one & three that twelve (12) teachers will be interviewed. On this issue, ten (10) teachers felt that Giyani Science Centre once played a significant role and lately its role is declining or one can say there is a gap between what was intended and what is happening in practice. Six of the

teachers started teaching before 1994, four of them after 1994. The following remarks by teachers illustrate the kind of feelings they had of the past:

“In the past the Giyani Science Centre used to conduct workshops on a regular basis and my school in particular benefited a lot. Before its establishment, science apparatus were insufficient and/or difficult to be found; after its establishment some were offered to schools, some kept in the centre to be borrowed when needed...”(Teacher 2, School C).

Another teacher said:

“... I had an opportunity of attending a diploma as an enrichment done by the Science centre... in those days when we attended a one day workshop we used to get a certificate of which if it came to six or seven, we were suppose to get a kind of a reward... money. We have a very big laboratory in my school, most of the equipment, chemicals apparatus were supplied by the science centre, two computers inclusive. Some of the most expensive apparatus and some dangerous chemicals to use in the presence of the kids were kept in the centre; we used to take our kids there for experiments. (Teacher 1, School A).

Similarly, the documents studied support the above when it says that teachers used to attend the INSET workshops for at least two days per term and as a year has four terms, eight workshops were conducted in a year's time. Another said:

“...By then I couldn't...I couldn't use the science equipment properly. Dr. A.W. Pell's (the founder consultant) presence enabled me to know exactly how to use the science equipment...”(Teacher 2, School F).

In general, in the past the objectives of the Giyani Science Centre have substantially been fulfilled. However careful probing on this dimension revealed that follow up evaluation was conducted by Dr. A.W Pell. On the issue of professional development, an in-service Diploma training for Science and Mathematics teachers were offered with some incentives/stimulus like salary increment by the government. Learners were also allowed to go visit the centre for lessons, together with their teachers. Also, Saturday classes and winter school lessons were offered. The findings also revealed that the two targeted major schools laboratories were fully equipped with resources, which were serviced regularly.

However, the major and non-major schools did not benefit equally. The past revealed that a sizeable number of teachers felt more comfortable/ were satisfied with how things were run. Although Dr. A.W. Pell was so excellent in his way of doing things, probing questions also revealed that as time goes on, increasing resistance was encountered. Another teacher had this to say:

“Dr A.W. Pell was a harsh authoritative kind of leader even to the principals during the workshops...”(Teacher 1, School D). In revealing literature on physical and psychological setting, Thembela (in Ashley&Mehl, 1987; 53-54) says:

“...Teachers must ...and learn to do away with authoritarian leadership which tends to stifle initiative and creativity...one needs an atmosphere that is relaxed, friendly and stimulating.”

The other two teachers interviewed showed no knowledge of the Giyani Science Centre, which means that they could not even understand its aims and importance, so they failed to explain its role. One strong reason for the partial support of these two teachers I can give might be that they were not yet employed when Giyani Science Centre was established. These teachers started teaching in 1996 but what surprises is the fact that other teachers who started the same year had something to say. When such teachers were asked about the role the Science Centre plays to their schools, the teacher asked me:

“What is this Science Centre for? Maybe if you can tell me its functions I’ll have something to say about it” (Teacher 1, School F). The only question they responded to is about how the Science Centre can be strengthened which will be discussed under linkage structures between the centre and the teachers.

The findings of what is happening at present reveal a gap between the intents and practice. On the issue of professional development activities for training staff the Science Education Diploma (SED) is no longer offered. The findings reveal that there were also Saturday classes but today these classes are no longer offered. The mobile laboratory which was used to reach the remote schools and/or schools with insufficient equipment is no longer operating, which according to the Director is due to transport problem, and according to about three teachers interviewed, the government is to be blamed in connection with transportation. In the past the

centre managed to service, fix the apparatus and the equipment not in good condition. Today it is failing to maintain some of them. About this, a teacher said:

“Two air conditioners were installed in our school laboratory, we were also offered two computers, the servicing of these equipment was done regularly in the past, but err...err...none of these are working today, err...err... the centre does not manage to fix them” (Teacher 1, Major school B).

All the teachers from the two major schools are no longer satisfied with the role the centre is playing at present. They say that the centre can now be regarded as a resource centre for science education, also, it has shifted from science education centre to holding meetings /workshops of all the subjects. It is said that its main focus today is offering OBE (Outcomes Based Education) courses. The focus in OBE is supported by one of the documents studied where one of its purposes is to conduct OBE workshops, see (Appendix E:4) also some of the invitations/circulars (also see Appendix D) studied were inviting teachers to attend workshops other than the science one. The document studied showed that the teachers attended INSET workshops at least two days per school term. The gap between the past and present is revealed when the Director of the centre said:

“...Our programme is one workshop per learning area per grade per quarter”(Director).

Looking at the Director’s statement, there is also a gap between what the Director said and what is happening in practice. Out of the 12 teachers interviewed, five teachers indicated that this year they attended only one workshop, three teachers attended two workshops, and five teachers did not attend even a single one. There is a gap between what the Director of the center sees as the role and how teachers perceive each role.

4.3.2 LINKAGE STRUCTURES BETWEEN THE SCIENCE CENTRE AND TEACHERS

Systems in place ensuring the smooth running of the communication was found lacking. Two teachers, one teaching Mathematics and the other teaching Physical Science from two of the non-major schools did not know about the existence of the Giyani Science Centre. According to them effective introduction programmes to familiarise them with the Centre can make a significant contribution. The Director and/or supervisors should go visit schools affected to find out the number

of new Science and Mathematics teachers so to make them aware of the Center's existence, its aims and importance.

From Major school A it was found that the Science Centre does not liaise with the teachers when it comes to the afternoon classes. One teacher said:

“The students go there for afternoon extra lessons...we are not told of the parts/chapters they tackle...we tackle some chapter in the normal schools hours and they tackle another aspect in the afternoon extra lessons” (Teacher 1, School A).

Hartshorne (in Ashley & Mehl; 1987:10) says that: “ Differing theories, policies and methods employed in the two levels could lead to dislocation and even chaos in the teaching situation in schools compounded by breakdown in communication...”

This was found to be problematic in School A, because there is a gap between what is being taught at school and in the Science Centre. Teachers feel it would be best if they are involved in the planning of the year's schedule of all the subjects, so to work hand in hand and the result would be that the afternoon lessons can be the continuation of the normal school lesson or vice-versa. However, the perspective of the Director gives another dimension. When asked whether the centre work hand in hand with the teachers in connection with the afternoon extra lessons, the Director said:

“We always liaise with the teachers...” (Director).

Lack of communication between the Science Centre and the teachers is one of the main reasons for some teachers not getting involved in the INSET programmes. The question of communication needs to be attended to. Barnard (1991:425) maintains that regular and effective two-way communication between the Science Centre and the teachers is needed to bind the various components of partnership into a closely-knit unit, for the mutual exchange of information.

4.3.3 TEACHER PARTICIPATION

INSET programmes coordinators/supervisors were generally found to be playing a more active role during the programmes. Out of 12 teachers interviewed, only two (2) teachers, one (1) Biology and one (1) Physical Science teacher considered themselves participating in the programmes. Although most teachers found their participation to be generally low, it emerged that there is a decision in which they are actively involved in, which is the evaluation of the coordinators by the teachers through a questionnaire. Participation in expressing their needs was reported to be generally low by all the teachers. About this a teacher said:

“Evaluation of needs is done during the programme. Some of us are not free to express ourselves when the forum is big... as a result we are told of what to do and how to do it” (Teacher 1, School D).

Mutshekwan (1995:85) maintains that teachers despise that “top down” INSET plans. Instead teachers prefer to be involved in the planning and organisation of INSET. Participation is seen to have an integrative function in the sense that it was considered to give rise to enhance group harmony and a sense of cooperation. Although findings revealed that there are subject committees, teachers suggested to be having effective once, where they can express their needs. They also want to be involved throughout the planning of the programmes, and not to some aspects only, so that instead of a top-down approach, a bottom-up approach can be implemented. In revealing literature about teacher participation again, Hartshorne (in Ashley & Mehl; 1987:10) says that: “INSET must be as democratic and as cooperative as possible, involving teachers actively at every stage and every level.”

4.3.4 USE OF CONSULTANTS

The use of consultants was found to be of most significance considering the role played by the Giyani Science Centre during the presence of Dr A.W. Pell (founder consultant) from 1989 until his contract expired in 1994 to the role being played by the centre from 1994 to date, without a consultant. Most teachers considered the absence of a consultant a counter attack to the down fall of the science centre, also to teachers’ resistance, because the consultant is the one who makes sure that everything contributing to the smooth running of the centre is available.

They suggested that if the Government, Department of Education in particular, provides the centre with a consultant who will make the department fully aware of the scale of the problems teachers have and the need for it to be solved.

4.3.5 CONTINUOUS EVALUATION

To assess the effectiveness of In-service education and to strengthen programmes, continuing evaluation is essential. In reviewing the literature on continuous evaluation, Oliva (1993:369) says that:

“Evaluation of in-service programmes can consist of...for example, pre-test and post-test.”

From all the teachers interviewed, it was found that the evaluations done are of need during the programme and stop when they fill out the forms of evaluating the coordinator and/or the workshop. No follow-up evaluations are done to be sure whether teachers really apply what they gain from the INSET. When asked about this, the Director said:

“...Well the follow-up evaluations are very limited because of constraints like transport. Ideally, we were supposed to make a follow-up after every workshop” (Director).

Teachers feel not motivated, even when they see invitation letters, they are not willing to attend. Therefore, they suggested that all types of evaluations should be exercised.

4.3.6 INCENTIVES

Findings revealed that incentives were offered to teachers attending the SED diploma. The diploma was free of charge to them, after completion, a diploma was given to teachers and the salary was also increased. Teachers who are/were not interested in this diploma although it is no longer offered, also want some kind of incentives for attending workshops either in the form of money or a certificate.

It was stated in section one under my claim that increasing resistance is encountered as teachers are expected to use their own time without any compensation. The findings revealed that incentives are not the major causes for increasing resistance, although they are part of these causes, the major ones are lack of linkage structures between the centre and the teachers, lack of teacher participation and lack of continuous evaluation.

4.4 POLICY IMPLICATIONS FOR IN-SERVICE TRAINING FOR THE 21ST CENTURY

As emerged throughout the report, INSET is more likely to be effective and successful when:

- There is a sincere commitment to it from the Government, the Department of Education in particular, a commitment, which arises from a full awareness of the scale of the problem and the need for it to be solved. The commitment has to be shown through active support and encouragement of INSET activities and provision of facilities and resources, both financial and human.
- It offers induction programmes to new teachers and is accommodative of teachers' input and not intimidating but cooperative, with all the types of evaluations being exercised.



UNIVERSITY
OF
JOHANNESBURG

4.5 CONCLUSION

This research has explored the teachers' perceptions of the contributions of Giyani Science Centre in the upliftment of education in the area. In particular, the study has explored the gaps between what was intended and what is happening in practice in the centre. This was looked at:

1. The role the science centre plays to schools in the area
2. Linkage structure between the centre and the teachers involved
3. Teachers' participation
4. Use of consultants
5. Continuous evaluation
6. Incentives

Lastly, readers are reminded that the present study should be taken as a case study. Therefore, its findings cannot be generalised to all types of science centres in South Africa and elsewhere. The findings are particular to the Giyani Science

Centre. Further research, utilising other research designs, is needed to confirm and/or disconfirm the findings of the present study.



4.6 BIBLIOGRAPHY

- Ashley, M.J. & Mehl, M.C. (1987). *INSET in South Africa. Issues & Directions*. TOPS. Cape Town: Credo Press.
- Bandi, N.D. (1995). *A critical study of attempts at democratising governance at a South African college of education*. (Unpublished Masters dissertation). Johannesburg: University of Witwatersrand.
- Bogdan, R.C. & Biklein, S.K. (1982). *Qualitative research for education: an introduction to theory and methods*. Boston : Allyn and Bacon.
- Bouwens, R.E.A. & Verkerk, G. (1988). *Inventarisaties van misconceptions in die optica. Voor Didactiek der SS-wetenschappen; Tijdschrift*, Vol.6(2): 83-89.
- Burgess, R.G. (ed) (1989). *Grey Areas: Ethical Dilemmas in Educational Ethnography*. In Burgess, R.G. (ed) (1989). *The Ethics of Educational Research*. London: The Falmer Press.
- Christie, P. (1990). *Open Schools: Racially Mixed Catholic Schools in South Africa, (1976-1985)*. Johannesburg: Ravan Press.
- Cohen, L. & Manion, L. (1991). *Research Methods in Education*. London: Croom Helm.
- Cohen, S. (1993). *Restoring the culture of teaching and learning: the challenge of Legitimacy*. Giyani College of education: A case study. Unpublished Conference paper.
- Cohen, S. (1994). *The curriculum and pupils' responses: A Case study in an Open Secondary School in South Africa*. (Unpublished Doctoral thesis). Johannesburg: University of the Witwatersrand.
- Collins, N. (1991). *New teaching skills*. London: Oxford University Press.
- Davidoff, S. & Van den Berg, O. (1990). *Changing your teaching: The challenge of the classroom in perspective in education*, Vol.12(2):103-5.
- Driver, R., Guesne, E. & Tiberghien, A. (1985). *Children's ideas in physics*. Philadelphia: Open University Press.

- Duke, D.L. (1980). Teachers and Shared Decision Making: The Costs and Benefits of Involvement. *Educational administration quarterly*. Vol.6 (1), (Winter 1980).
- Enslin, P. (1990). "Science and Doctrine: Theoretical Discourse in South Africa "Teacher Education." in Nkomo, Med (1990). *Pedagogy of Domination: Towards a Democratic Education in South Africa*. New Jersey: Africa World Press, Inc.
- Hartshorne, K. (1992). *Crisis and Challenge: Black Education (1910-1990)*. London: Oxford University Press.
- Hitchcock, G. & Hughes, D. (1989). *Research and the Teacher: A Qualitative Introduction to School-based Research*. London: Routledge.
- Magagula C.M. (1991). Level of Bureaucratisation of the Educational system and schools of Swaziland. *SIER Bulletin* 12, : 41-52.
- Magagula, C.M. (1995). The issue of paradigms in Educational Research: Keeping the Debate Alive. In Coetzee J.H.& Smith, T.G. (eds.). *Education and Change*. Pretoria: University of South Africa.
- Miles, M.B. & Huberman, A. (1984). *Qualitative Data Analysis: A Sourcebook of New Methods*. Beverly Hills, California: Sage.
- Mutshekwana, M.A. (1995). In-service education and training of teaching in Venda. *SAJHE* vol. 9 (2):155-159.
- NEPI Research Report on Teacher Education. (1992). Cape Town: Oxford University Press.
- Oliva, P.F. (1993). *Supervision for today's schools* 4th ed. New York: Longman.
- Pell, A.W. (1987). *A Report on Science Education in secondary schools in Gazankulu. Recommendations for Action*. Unpublished report.
- Popkewitz, T.S. (1984). *Paradigm and ideology in educational research: The Social Functions of the Intellectual*. London: Falmer Press.
- Scott, S. (1985). Feminist research and qualitative methods: A discussion of the issues. In Burgess, R.G. (ed) (1995). *Issues in Educational Research: Qualitative Methods*. Lewes: Falmer Press.

Staton, M. (1989). A critical investigation into alternative concepts in fundamental electric concepts, as held by senior secondary pupils and students at the tertiary level in South Africa. (Unpublished Masters dissertation). Pretoria: Unisa.

Thijs, G.D. & Van den Berg, E.D. (1950). Cultural factors in the origin and remediation of alternative conceptions in Physics. *Science education* 4 :317-347.

Williams, M. (1991). In-service education and training: Policy and practice. London: Manpower service commission.



APPENDIX A

P.O. BOX 2603
GIYANI
0826
1 OCTOBER 2000

The Director General
Department of Education
Pietersburg
0700

Sir

REQUEST TO CONDUCT A RESEARCH

I would appreciate you for considering my request to conduct a research in your institutions under the topic: "TEACHERS PERCEPTIONS OF THE CONTRIBUTIONS OF GIYANI SCIENCE CENTRE."

DATA TECHNIQUES TO BE USED ARE:

1. INTERVIEW

The open-ended interview questions will be used to enable the interviewees to use their own words and interpretations with little or no influence, e.g. teachers will be asked to "DESCRIBE THE ROLE THE SCIENCE CENTRE PLAYS IN THEIR SCHOOLS".

2. DOCUMENT ANALYSIS

The following documents were seen to be of relevance in this study:

- Giyani Science Centre's mission
- The Centre's policy
- Invitation letters
- Attendance register

Thanking you in anticipation

Yours faithfully

Bandi Masingita Tonia (Miss)

Northern Province

DEPARTMENT OF EDUCATION

101 Dorp Street
Private Bag X9489
PIETERSBURG
0700

Tel.: 015 297 0110, 015 297
0590, 297 0392, 297 0386
Fax: 015 297 0885, 015
297 0872

ENQ : Prof. D.M.D. Mahlangu
TEL : 015 297 0110
CELL: 082 570 6384
FAX : 015 2974117/0872

18/10/1999


Ms. Tonia Masingita Bandi

REQUEST TO CONDUCT RESEARCH.

UNIVERSITY
OF
JOHANNESBURG

1. Your letter dated 1st October 1999 refers.
2. It is a pleasure for the Department to inform you that permission has been granted for you to conduct research in our institutions on the topic: **TEACHERS' PERCEPTIONS TO THE CONTRIBUTIONS OF GIYANI SCIENCE CENTRE IN THE UPLIFTMENT OF EDUCATION IN THE AREA** towards your M.Ed.- Teacher Education with RAU.
3. The Department further wishes to inform you that there is a Science Centre at Mhala, which is in the same area and that for the sake of completeness of your research, it would be advisable to include it in your investigation. Please discuss with your supervisor.
4. The Department will request a bound copy of your dissertation after completion of your studies.

Good luck.


.....
ACTING SUPERINTENDENT GENERAL

APPENDIX C

BASIC INTERVIEW SCHEDULE

1. Describe the role the Giyani Science Centre plays in your school.
2. Do you as an individual understand its aims and importance?
3. How often does it conduct the workshops?
4. To what extent do you see it being practical?
5. Who participates in the planning of the INSET programmes?
6. Do you as an individual see yourself as given a chance to make decision?
7. In which decision committee(s) are you?
8. In which decisions do you participate?
 - At the beginning
 - At the end
 - Throughout
9. To what extent do you have a final say in the planning of the programmes?
10. What are the factors which limit your own and others' participation in decision making?
11. What are the factors which could hamper the functioning of Giyani Science Centre?
12. What are the factors which could strengthen it?



**NORTHERN PROVINCE
EDUCATION, ARTS, CULTURE & SPORTS**

NORTH EASTERN REGION

ENQ: MATJOKANA F.W.
TEL: 0158 23782
FAX: 0158 23412

P/BAG X578
GIYANI
0826
20-04-98

TO: THE AREA MANAGER
CIRCUIT MANAGERS
PRINCIPALS OF PRIMARY SCHOOLS
HISTORY TEACHERS

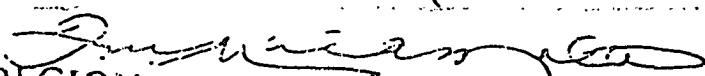
**ENVIRONMENTAL EDUCATION WORKSHOP FOR HISTORY &
GEOGRAPHY TEACHERS**

EXPECTED OUTCOMES OF THE WORKSHOP ; TEACHERS WILL

- * Conduct an environmental audit
- * Conduct independent fieldwork for the collection and representation of information about the area. (Giyani Science Centre and surrounding features)
- * Understand the nature of spatial and variations over the earth
- * Explain changes to the land uses in indigenous Giyani areas.
- * Investigate why individuals hold different views on issues relating to the use of resources.
- * Examine how and why people's and environmental interaction change overtime at particular places.
- * Research and analyse enviromental issues in the local area (Giyani for example)

Time : 9h00
Date: 5th June 1998
At Giyani Science Centre

REGIONAL DIRECTOR (NORTH EASTERN REGION)


REGIONAL DIRECTOR (NORTH EASTERN REGION)

**NORTHERN PROVINCE
EDUCATION, ARTS, CULTURE & SPORTS**

NORTH EASTERN REGION

ENQ: MBHALATI G-F.

TEL: 015 8123782

FAX: 015 8123412

PRIVATE BAG X578

GIYANI

0826

30.04.99

**TO: PRINCIPALS OF SECONDARY SCHOOLS :
BIOLOGY GRADE 12 EDUCATORS**

BIOLOGY GRADE 12 EXAMINER'S WORKSHOP

1. The examiner for Biology grade 12 H.G. will conduct a workshop for all educators teaching Biology in grade 12. The workshop is arranged as follows:

1.1. Date: Wednesday 5.5.99

1.2 Time: 09H30

1.3 Venue: Giyani Science Centre



UNIVERSITY
OF
JOHANNESBURG.

2. Educators are requested to bring along the syllabus, work programme and textbooks that they use.

3. The workshop for Biology grade 10 (std 8) educators scheduled for the same day as per circular dated 15.03.99 is hereby cancelled.

Yours faithfully,


REGIONAL DIRECTOR (NORTH EASTERN REGION)

**NORTHERN PROVINCE
EDUCATION, ARTS, CULTURE & SPORTS**

NORTH EASTERN REGION

ENQ: MBHALATI G.F.
TEL: 015 8123782
FAX: 015 8123412

PRIVATE BAG X578
GIYANI
0826
09.02.1999

**TO: PRINCIPALS OF SECONDARY SCHOOLS
GRADE 12 BIOLOGY TEACHERS**

GRADE 12 BIOLOGY WORKSHOP

1. In the biology workshop on 08.02.99 grade 12 teachers expressed the need for a three day comprehensive workshop. The aim of the workshop is to upgrade teachers' competency in biology grade 12 content and methodology which the teachers expressed is acutely lacking. The workshop will take the mode of lectures, discussion groups and practical work.

It cannot be overemphasised that this is an important effort to improve poor results in grade 12 and therefore teachers cannot afford failure to attend the workshop.

2. Teachers must bring along the following documents:- syllabus, work programme(issued to all schools by the Centre) and textbook(s). Please note that there will be no catering. There are restaurants near the Science Centre.
3. The biology committee for the Giyani Area will also be elected during the workshop.

APPENDIX E

1. Resources

1.1 Physical resources (buildings)

300 seater conditioned Lecture hall
30 seater air conditioned Laboratory
35 seater reading room
1 library
1 computer room
2 x 30 seater lecture rooms
1 workshop
1 studio
1 x kitchen
1 x reception office
1 x conference room
1 x manager's office
6 x store rooms
2 x sets of toilets
car pot

1.2 Equipment

8 x overhead projectors
4 x movie boxes
3 x air conditioner plants
24 x computers
4 x computer printers
1 x fax machine

- 1 x type writer
- 1 x photocopier
- 1 x stove
- 2 x EL refrigerators
- 4 x wall watches
- 2 x video cameras
- 1 x photo camera
- 1 x video editing machine
- 1 x video projector
- 1 x VCR
- 1 x TV set

1.3 Human resource

Giyani Science Centre staff comprises the following:

- 7 science, maths and technology co-ordinators/teachers.
- 3 administration clerks
- 2 drivers
- 4 security guards
- 11 cleaners

2. The achievements of Giyani Science Centre

The Giyani Science Centre was established in 1989 to achieve the following objectives.

- a. To be the focal point of all science educational activities.
- b. To provide in-service Diploma training for science and mathematics teachers-
- c. To provide winter schools for science teachers and pupils.
- d. To conduct a weekly std 10 science lecture programme for schools.
- e. To be a study and advice centre for all science teachers.
- f. To conduct adult education programmes in science and technology.
- g. To service schools by way of repairing equipment, preparing and issuing work programmes/packages.

(A report on Science Education in Secondary Schools in Gazankulu (1987) and Recommendations for Action: Dr A.W. Pell).

By and large the Centre has achieved the above-mentioned aims. The Centre has been a focal point of all science educational activities in this region since it opened the doors of learning ten years ago. In-service training of maths, science and technology educators, conferences, seminars, meetings, enrichment classes for primary and secondary school learners, competitions, career exhibitions and other science related events have been taking place at the Centre.

About 350 science and maths educators have received training in the form of the Science Education Diploma (SED) since 1989. The Centre conducted winter school classes in maths and science in the past ten years except in 1998. These classes supplemented schools efforts in achieving good results. Over 100 000 primary and secondary maths, science, computer and electronics learners have benefited from the

Centre's enrichment programme during the period of existence of the Centre. The Centre established computer studies and electronics at respectively Giyani High School and Kheto Nxumalo Agric. High School as fully fledged school and examinable subjects from grade 10 to 12.

The above-mentioned schools have operated as science major schools since 1989. Through the major school project, the Centre has assisted 60 grade 12 learners per year from these schools to actualise their potential in maths and science. Some of these learners are in science and technology careers and others are pursuing studies in these fields.

The Centre has been the place from which new equipment was dispatched to schools, non-functional equipment was adjusted to a working condition and broken equipment in schools was repaired and returned to schools. In addition, schools got supplies of consumables on request.

This service has been accompanied by equipping educators with skills to use and care for the equipment issued to them. Educators in every grade attended inset workshops for at least 2 days per school term. By and large all schools that benefit from the Centre have syllabuses, work programmes and other learning area related documents. This service is carried out the Centre on regular basis.

3. The mission and purpose of the Science Centre

3.1 Mission Statement

To develop and enhance science, mathematics and technology education in response to the social expectation of the majority of South Africans and to produce re-educated science, mathematics and technology teachers capable of generating self-supporting curriculum programmes in science, mathematics and technology as fully compatible with the democratic goals of the new South Africa.

3.2 The purpose of Giyani Science Centre

The Science Centre serves the following purpose:-

1. Retraining primary and secondary science, maths and technology teachers in curriculum content and methodology;
2. Enriching the basic school science, maths and technology education of primary and secondary learners who are based on a regular basis for a day's activities at the centre;
3. Providing specialist science teaching for the selected major school learners who are educated at the nearby secondary schools;
4. Offering specialist courses in electronics and computer studies;
5. Co-ordinating the supply of science equipment to the schools;
6. Acting as a focal point for teacher-led curriculum development schemes such as the primary science programme;

7. Acting as focal point for the training and development of the Outcomes based education (OBE) curriculum for the new South Africa.
8. Acting as a base for mobile unit outreach activities;
9. Producing video material for the teaching of science, mathematics and technology;
10. Producing science modules for the teaching of science;
11. Acting as a facilitator for the establishment of new Science Centres in the Province;
12. Serving as a resource Centre for learners and educators in science, mathematics and technology education;



UNIVERSITY
OF
JOHANNESBURG