



UNIVERSITY
OF NATAL
CASS
DURBAN

THE SCIENCE EDUCATION PROJECT
IN KWAZULU:

SOME EXPERIENCES, ATTITUDES AND
PROBLEMS OF PROJECT TEACHERS

F.J. Lund
March 1983.

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1. BACKGROUND TO THE SCIENCE EDUCATION PROJECT

Black education in South Africa is in crisis. While there has been a 1070% increase in the numbers of black children reaching matric level in the last ten years, the standard of teaching remains poor, and the physical conditions of overcrowded classrooms and lack of basic equipment are problems which have yet to be overcome.

The problems regarding the teaching of Science subjects are possibly most acute. On the one hand, increasing numbers of students are realising that Science subjects are a valuable prerequisite for many forms of future employment. On the other hand, the Science teachers themselves have received poor schooling in Science subjects. They often teach in schools with no laboratory, no electricity, and no basic scientific apparatus.

The Science Education Project emerged in response to these problems. The following extract¹⁾ gives a brief outline of its history and operation:

"The Science Education Project was initiated in 1976, with the prime aim of improving the quality of science education in schools at the junior secondary level. The main development phase of Project materials took place from 1976 to 1980. The Project was based at Fort Hare University in the Ciskei. Funding for the development phase came from the Anglo-American de Beers Group Chairman's Fund. During this time, a portable kit, worksheets and teachers' guides were produced and evaluated in schools. Various implementation strategies were also developed and tested during this period. Because the facilities in Black schools for science education were so poor it was decided to put most of the Project resources into these

1) From the Five Year Project Plan (1981 - 1985) drawn up by SEP national office.

schools first.

From 1981 onwards, the emphasis is being placed more on implementation than on development. Phase one of the implementation phase consists of initiating pilot schemes in a number of areas to be undertaken by members of the Science Education Project Staff. Areas where phase one is now in progress include Soweto, KwaZulu and Transkei. Smaller Project implementations are taking place in Lenasia, Port Alfred and in some private schools."

SEP in KwaZulu runs from the Department of Extra Mural Studies at the University of Natal, Durban. Project materials and methods were introduced into KwaZulu schools in the Durban area in 1980. By the end of 1982, SEP was operating in 31 schools in four educational circuits: Umbumbulu, Umlazi North, Umlazi South and KwaMashu. Seventy six teachers and approximately 10 000 pupils are involved.

The provision of kits, worksheets for pupils and teachers' guides is but one aspect of the program. SEP stresses 'learning by doing' - there is an attempt to move away from memorising and rote-learning, towards the active involvement of students in the processes of Science. SEP hopes to foster students' critical thinking abilities through this process, inculcating learning skills which are not simply restricted to 'getting better marks in Science'.

The project also aims in its implementation strategy to improve the quality of Science teaching by involving the teachers more actively in their professional growth. The two implementors visit teachers at their schools (approximately 300 visits were undertaken during 1982) where any problems regarding methods and use of the materials can be discussed. Simultaneously, structures are being set up whereby the teachers are becoming increasingly involved in the administration and maintenance of the project.

In 1981, after teachers had gained confidence with the materials and approach, a Project Committee of teachers was formed. An exciting new development in 1982 has been the initiation of the Zonal Programme, half way through the year. Teachers are organised in zones, each with an elected leader, on a geographical basis, and take on more responsibility for the running of the Project. Through this, teachers have a more localised and definite structure for continuing support and professional growth.

2. BACKGROUND TO THE SURVEY

Since SEP's inception, strong emphasis has been placed on evaluation studies. Many reports are available on studies which have *inter alia*

- established the need for SEP
- monitored progress in terms of student marks and student and teacher attitudes
- evaluated the use and usefulness of the kits, worksheets and teacher guides.

The implementors in Durban are planning an in-depth survey of teacher attitudes in 1983. However, they wanted some form of feedback from teachers, at the end of 1982, which could

- give an indication of how teachers were feeling about the Project and some of the implementation strategies,
- guide them in their plans for consolidation and expansion in the following year, and
- provide leads for areas which could be investigated in the in-depth study.

The Centre for Applied Social Sciences was approached to undertake this brief survey.

3. SURVEY METHOD

One could write, in respectable academic terms: 'Time constraints forced a hasty compilation of the survey schedule.' What we were actually faced with was a case of: Friday - we decided to do the survey; Monday three days later - the schedules had to be out!

The Friday in question was in the third week of November, and schools were closing at the end of that month. It was necessary to reach the teachers before the term ended because they would be inaccessible during the holidays. Given the shortage of time, we reluctantly decided that a self-administered questionnaire was the only way of reaching the teachers - survey forms could be delivered to them, and mailed back to CASS.

This decision was made reluctantly because self-administered questionnaires are known to have limited effectiveness: there is typically a low response rate, and a high risk of survey questions being misunderstood or ambiguously answered.

We felt (mistakenly, as it turned out) that there was a good chance of getting a high response rate. The teachers had established rapport with the implementors, and the covering letter could point out to them that it would be the teachers' benefit to complete the questionnaire. The SEP newsletter, circulated at the same time as the questionnaires, included a short explanation of why the survey was being done, and encouraged teachers to co-operate.

By keeping the questionnaire simple we hoped to reduce the risk of ambiguity in questions and answers - a particularly serious risk when a questionnaire is drawn up in English and completed by Zulu speakers. There was no time to pilot the questionnaire, but it was checked by a Zulu-speaking colleague who suggested some modifications.

The questionnaire (Appendix 1) and covering letter (Appendix 2)

were sent to every SEP teacher in the Durban area - seventy-six teachers. Some were delivered personally, others were given to one teacher in a school or zone to distribute to others.

By the end of December (closing date for return was 30th November) only 20 forms had been completed and returned - a disappointing 26 percent response rate. The 1983 evaluation will try and find out from teachers why the response was so poor. Here one can only speculate as to possible reasons:

- low response rates are intrinsic to this form of survey
- the covering letter could have 'missed the boat' in terms of spelling out in what ways teachers could benefit by participating in the survey
- lack of motivation of teachers
- inadequate delivery system - we have subsequently heard of some teachers who received their questionnaires in January 1983
- the end of the year is a particularly busy time for teachers with marking and schedules to be completed
- teachers in 1982 were involved in invigilating outside their own schools which created time pressures and upsets in routine
- the covering letter read 'please return the forms as soon as possible but not later than 30th November'. Imposing this cut-off date was an attempt to urge rapid completion and return of the forms. In fact it certainly contributed to the low response rate. We have heard of teachers who received their forms after the end of November, and decided it was not worth sending them in as they would be too late for consideration. This was an obvious error in the covering letter - possibly a useful tip for other researchers.

Presentation of results and outline of the report

The low number of respondents has meant that it would be both inappropriate and pretentious to apply complex statistical procedures. The results have thus been presented in a simple form, using primarily frequency distributions and often the written comments of the teachers themselves. At appropriate points in the report, the danger of drawing firm conclusions from this small sample is mentioned. However, responses to many sections of the schedule were so markedly unanimous that they can be taken as a fairly reliable indication of teachers' feelings and attitudes.

After presenting a teacher profile, we discuss the effects of the Project on various aspects of the teachers' development. A section deals with the influence of SEP on the teaching of other, non-Science subjects, and another with the changing relationship between teachers and pupils. Major problems foreseen by teachers in 1983 are compared to what they saw as their major problems when they joined the Project. The report then describes attitudes to the new Zonal Programme. It concludes with a summary, and some concluding comments from the author.

4. TEACHER PROFILE

In this section, a profile of respondents is given, in terms of the following categories:

- sex
- age
- qualifications
- teaching experience
- Science subjects taught in 1982
- other subjects taught in 1982
- membership of Project Committee.

The SEP implementors have made available background information on 60 of the 76 SEP teachers. By comparing data from our respondents with SEP data, it has been possible to check whether respondents are broadly representative of the whole sample in terms of age, sex and qualifications.

4.1 Sex

	TS*	SEP*
Female	8	28
Male	10	32
No info.	2	0
TOTAL	20	60

The teacher survey sample approximates SEP data in terms of male : female ratio.

* TS = present Teacher Survey data.

SEP = information gathered by SEP.

4.2 Age

	TS	SEP
20	0	1
21-25	7	21
26-30	9	23
31-35	3	8
36-40	0	1
40	0	5
No info.	1	1
TOTAL	20	60

The teacher survey sample is under-represented in the younger and older age categories. However, within the three age categories where most teachers lie, the proportions are similar.

4.3 Qualifications

	TS	SEP
Primary Teaching Certificate	7	22
Junior Secondary Teaching Certificate	8	28
Senior Secondary Teaching Certificate	0	1
Senior Teaching Diploma	2	4
Additional higher qualifications	1	5
No information	2	0
TOTAL	20	60

The present sample is under-represented for higher qualifications, and slightly over-represented in the Primary Teaching Certificate category. Otherwise proportions in each category are approximately the same.

Teachers were asked whether Science had been one of the specialist subjects in their teaching diploma. Eight of the respondents, or 40 percent, had not studied Science at this higher level.

Teachers specified the last standard in which they had passed Physical Science and Biology. Results were as follows:

Last standard passed	7	8	9	10	No. info.	Total
Biology	1	0	0	15	4	20
Physical Science	2	5	2	8	3	20

It can be seen that while three quarters had passed matric Biology, less than half (8) had reached matric level in Physical Science.

This low level of Science education amongst Science teachers was one of the reasons for SEP's inception. It has been a cause of serious concern in black education, to teachers and pupils alike. It would

not be unusual to find a teacher giving lessons to a more senior class than that teacher himself passed.

4.4 Teaching experience

No. years Teaching	No. Teachers
1	1
2	5
3	2
4	2
----- 50% -----	
5	3
+5	6
No. info.	1
TOTAL	20

The mean number of years teaching experience is 5,05. Half (10) of the teachers had been teaching for up to four years.

4.5 Science subjects taught during 1982

Subject	No. of teachers
General Science Std. 6	3
General Science Std. 7	15
Physical Science Std. 8	8
Biology Std. 8	4

4.6 Other subjects taught by SEP teachers during 1982

Teachers were asked what subjects apart from the above they had taught during 1982.

Twelve teachers had taught Maths, five taught Afrikaans, one taught both Afrikaans and Business Economics, and one was a Guidance teacher.

In addition to this formal teaching, teachers are expected to spend considerable time on such extra-mural activities as choir and sports practices. This will be discussed later in the report.

It was clear from responses to another question that some teachers had, prior to 1982, taught other subjects as well. Zulu and History were most often mentioned.

Some teachers mentioned that they did not know what subjects they would be teaching in 1983.

You are just told at the beginning of a year what you must teach.

I don't know whether I will be teaching Science next year.

4.7 Project Committee membership

Seven, or nearly a third, of the respondents indicated that they were members of the Project Committee.

There are 13 Project Committee members (8 Zonal Leaders and five other representatives) - they thus form about one sixth of the full number of 76 SEP teachers.

As may have been expected, we see an over-representation of Committee members in this sample. As the elected leaders, they are more likely than other teachers to have been motivated to participate in the survey.

5. TEACHERS ATTITUDES TO, AND EXPERIENCES OF, THE PROJECT

A SEP implementor has said:

If all we do is to provide schools with Science equipment, we have not succeeded.

This survey did not set out to evaluate teachers' assessment of the SEP materials - the hardware. Evaluations of their effectiveness and usefulness have already been done. Our point of departure was: we know the hardware has been appreciated - what other differences has the Project made?

Thus a primary objective was to explore teachers' attitudes. In particular we wanted to establish how these had changed over time, and whether there was a match between the teachers' perceptions and experience of SEP, and the objectives of the organisers.

The measurement of attitudes is a difficult task at the best of times. When it became clear that there would be no time for personal interviews, we decided on four simple questions or groups of questions, each with a different design. (See Schedule, Appendix 1.) These were:

- Q13: an open-ended question asking for three ways in which the Project had affected teachers.
- Q14: a self-scored before - after test in which teachers gave themselves marks according to seven criteria.
- Q9 and Q10: a set of questions asking teachers to state their feelings about and expectations of SEP when first joining, and whether there had been any change in these feelings and expectations following experience with the Project.
- Q15: a conventional attitude scale in which teachers were given a set of statements to which they had to indicate 'agree', 'disagree', or 'don't know/feel neutral'.

We knew there would be some overlapping in responses to parts of these questions, but hoped that the combination of these sets of questions

would yield sufficient information that some conclusions could be drawn.

The teachers' responses were overwhelmingly positive. It has been shown that there were sound practical reasons which made it impossible for some teachers to return the survey forms: there is thus no reason to believe it was only the most satisfied teachers who responded. However, given the possibility of a biased sample, the point of departure in presenting this section has been: the teachers feel very positively towards the Project - what do they feel most positive about, and why?

5.1 Q13: the open-ended question

We asked the question:

'Please mention three ways in which SEP has affected you.'

This was designed to elicit spontaneous responses. In asking for three ways we hoped to get teachers to think specifically, and to avoid generalised positive or negative statements. We expected many responses to focus on equipment and apparatus, and wanted to get that out of the way before proceeding to the more intangible levels of feelings and attitudes. Also, as no pilot study was run, it was felt that criteria not included in the more structured questions could appear in the answers here.

Before going on to a content analysis of those responses which can be regarded as positive, the following should be noted:

1. Three teachers did not answer.
2. One person answered 'none'. However this same person made positive and constructive comments in other parts of the schedule.

3. One teacher answered 'morally, physically, intellectually'. Such a generalised answer was impossible to classify according to the categories chosen.
4. One person expressed disappointment at not having been selected to go to the United Kingdom for a training course organised for SEP leaders.

The fourteen remaining teachers all responded positively, giving three statements each. These have been categorised as follows:

Increased love of/interest in Science	11
Increased confidence (personally and in teaching)	8
General improvement as a teacher	9
Better use of apparatus	5
Better syllabus preparation and lesson planning	5
Positive effects of the Zonal Programme	4
	<hr/>
	42
	<hr/>

Comments

1. A striking aspect of these results is that eleven of the fourteen gave answers which showed their new enthusiasm for and interest in Science. It is well known that a teacher's attitude to a subject is conveyed in the classroom, and affects pupils' attitudes.

Characteristic responses were:

It has made me eager to know more about Science.

It has caused me to appreciate and love Science.

I now do a lot of reading in the line of Science.

2. Another group of responses that featured prominently related to the increase in self-confidence which teachers attribute to SEP. Their previous lack of confidence stems partly from their poor

Science backgrounds - less than half the teachers in this sample have matric level in Physical Science. Some are teaching a higher standard than they themselves have reached.

3. While nine teachers mentioned the improvement in their general effectiveness as teachers, a further five gave statements which referred specifically to the importance of the apparatus, and five more spoke of their ability to plan and prepare syllabus and lessons more effectively.
4. Four people referred to the Zonal Programme: three said that it had improved their relationships with colleagues, while one said it had taught him or her how to organise people.

5.2 Q14: the before - after test

Teachers were asked to give themselves a score out of ten on seven criteria, both before joining SEP and after joining SEP (at the present time). Schlemmer *et al.* (1982) used a similar test amongst teachers in Bophutatswana, arguing that teachers are familiar with this form of assessment.

The criteria reflect areas in which SEP organisers expected teachers to have been influenced by the Project. A 'dummy variable', your fluency in English, was included to check against uncritical scoring. It will be seen that this was only partially successful as a dummy.

TABLE: TEACHERS SELF-SCORED TEST

	Mean score 'before'	Mean score 'after'	Difference in means	Rank 'before'	Rank 'after'	Rank movement
Your ability as a <u>teacher generally</u>	6,2	8,5	2,3	1	4	-3
Your fluency in <u>English</u>	5,66	7,94	2,28	2	7	-5
Your <u>interest</u> in Science	5,3	9	3,7	3	1	+2
Your ability as a <u>Science teacher</u>	5,1	8	2,9	4	6	-2
Your confidence as a <u>person</u>	4,94	8,72	3,78	5	3	+2
Your <u>knowledge of Science</u>	4,94	8,16	3,22	5	5	0
Your confidence in doing <u>practical work</u>	4	8,94	4,94	6	2	+4

- NOTE:
- means have been calculated to two decimal points
 - the change in rank order is a relative measurement: i.e. that ability as a Science teacher moved from four to six does not mean that respondents assess themselves as less able Science teachers after joining SEP!
 - The absolute scores are meaningless in themselves - one teacher's 3 out of 10 is not equivalent to another's 3 out of 10. By summing the scores and assessing the means, and differences between means before and after, we can assess changes in rank before and after, and relative amount of movement.

Comments

1. The first point to make, and one which is not reflected in the data above, is that no one teacher moved backward in scores from 'before' to 'after' for any criterion!
2. The criterion most influenced was confidence in doing practical work. It showed the biggest movement in rank order (from lowest to second highest), and the biggest difference in mean score, from before to after (difference in means: 4,94).

The influence of SEP on teachers' confidence as a person shows up in its receiving the second biggest difference in means (3,7), and it moves up two positions in relative ranking.

This theme of SEP's contribution to teachers' confidence appears throughout their answers to the schedule.

3. Teachers gave themselves the highest after score on your interest in Science and this also moved up two positions in relative ranking. While they felt that their knowledge of Science had improved since joining SEP, this showed no movement in relative ranking, ranking fifth both before and after.
4. It is interesting to note that your ability as a teacher generally ranked highest before joining SEP, but moved second last, after the dummy (difference in means: 2,3). While their interest in Science has been affected, and their confidence in the practical side of teaching has grown, teachers still rank their ability as a Science teacher fairly low, relative to the other criteria, but higher than their ability as a teacher generally.
5. Your fluency in English was intended as a dummy variable - in retrospect it is easy to explain why it succeeded only partially. A perfect dummy would have registered no change in scores before and after. Teachers in fact scored themselves higher after than

before, but whereas it ranked second highest before, it ranked lowest after. This shows that although teachers felt their English had improved through involvement with SEP, it changed least compared to the other criteria (difference in means: 2,28).

If involvement with SEP has in fact improved English fluency (rather than teachers simply believing that to be so) there would be two good reasons for it:

- teachers have contact with the implementors in an educational system where there is generally little contact with first-language English speakers
- the worksheets and teacher guides use simple English, and often define complex scientific terms.

5.3 Q9 and Q10: the meeting of previous expectations of SEP

The intention with this set of questions was to establish whether teachers' initial expectations of the Project had been met through their experience with the Project.

Questions such as these, which ask people to remember past states of mind, usually have the problem that responses may be clouded by experiences in the intervening years. They are particularly problematic where there is no interviewer present to probe for detail. Nevertheless we decided to include the set, to supplement the other questions.

The questions were poorly worded and laid out. There were many ambiguous responses, and many which indicated lack of understanding of a question (e.g. 'what made you unhappy' was interpreted as 'what makes you unhappy now' by some people).

Comments

Most of the teachers stated they had looked forward to SEP's introduction, specifically mentioning acquiring apparatus and learning new methods of

teaching Science. They stated that SEP had met, and in many cases exceeded their expectations.

Three gave specific reasons for their unhappiness at the prospect of joining SEP, and it is interesting to compare their prior and present attitudes:

I took it as a waste of time.

No time is wasted. A lot of work is accurately covered in a short period.

I thought it would be time consuming. I hadn't used apparatus before. Most of the work was theory.

For the first of its kind I finished the work in September. The results of my pupils improved. The teacher and the child are now involved, not only the teacher and the black-board. I find some difficult concepts more clearly explained by the doing of experiments.

At first I thought they were doing it for money and I thought my school could not afford kits.

To my surprise everything was free. It relieved me from the burden of teaching theoretically. Even pupils are now having confidence that they will know the subject better.

5.4 Q15: a conventional attitude scale

Question 15 was a 'shopping bag' of statements which reflected various concerns of the organisers. The question and results are laid out below.

'SEP is run differently in other parts of the country, and teachers have different ideas about it. Below are some statements that have been made by other Project teachers. Could you mark with a tick in correct column what you think about each statement: whether you agree with it disagree with it, or don't really know/feel neutral.'

	Agree	Don't know/ Feel neutral	Disagree
1. 'Other teachers at my school think that the Project takes too much time from their lessons.'	6	6	8
2. 'Working with SEP has improved my confidence to organise other activities outside lessons.'	18	0	1
3. 'Working with SEP has increased my ability to represent people on a committee.'	11	6	2
4. 'SEP methods make a problem of discipline in the classroom.'	2	5	12
5. 'Other teachers at my school would like a similar project to SEP for their subjects.'	11	6	2
6. 'The SEP implementors make too many decisions without consulting the teachers.'	0	1	18
7. 'SEP belongs to the Science teachers who join it.'	7	4	8

NOTE: One respondent marked the items in such a way that it was impossible to tell which column was being ticked. His/her responses were not taken into account.

Comments

Answers to items 2,3,6 and 7 are discussed in the section of the report dealing with the Zonal Programme.

Items 1 and 5: SEP's future and successful functioning depend, *inter alia*, on a good relationship between the Project teachers and other school personnel. Project lessons sometimes run over into time

allocated to other lessons, and the implementors wanted to check whether SEP teachers considered that other teachers perceive this as a problem. Six (about a third) agreed with the statement. This may seem a small number, but if this sample is representative of all 76 SEP teachers, it could be or could become, a significant cause of friction between SEP and other teachers.

It is heartening to see that more than half of the teachers feel that other teachers at their school would like a similar project to SEP for their subjects. This test is much too superficial to draw any conclusions, but at least teachers are perceiving a positive response to their project from other teachers. Perhaps the fuller investigation into teachers' attitudes planned for 1983 could include a side-investigation of non-Project teachers' attitudes to detect possible sources of friction and satisfaction or dissatisfaction.

Item 4: SEP evaluation studies in other areas have indicated that the introduction of the new approach and methods relieve teachers of a lot of the burden of discipline. Pupils' participation and interest in the experiments and processes of Science seem to remove the need for heavy handed rule which is known to characterise many (black) classrooms. MacDonald (1980: 32) has suggested that the teachers themselves may become more tolerant of what rowdiness there is when desks and equipment have to be moved to accommodate the group method.

The majority of our sample (12) did not feel that SEP creates problems with discipline, and only two agreed with the statement.

6. SEP'S INFLUENCE ON THE TEACHING OF OTHER SUBJECTS

The SEP approach stresses student participation, group work, and practical problem solving - processes which are not commonly encountered in the educational system in South Africa, least of all in black schools. Also, the implementors, in their individual meetings with teachers and in workshops and refresher courses, stress the importance of structuring of lessons, and the awareness of objectives when planning lessons.

One of SEP's hopes is that the approach, and skills learned in teaching Science subjects, will transfer to the teaching of other subjects as well.

In order to see whether the teachers thought they were using the SEP method and approach in other subjects, the following questions (Q12) were asked:

'This might be a difficult question to answer, but please try! Has the method of teaching you have used with SEP helped you with your teaching of other subjects?'

'If the answer is yes, could you give some examples of how it has helped with other subjects.'

Fourteen respondents replied that the method had helped in other subjects, while five felt it had not (one no response).

It was clear, when specific examples were cited, that three of the fourteen had misunderstood the question - they mentioned how SEP had helped with SEP subjects.

The remaining responses can be grouped in two categories:

6.1 Shared subject content with Maths

Four teachers gave specific examples of how SEP material had helped with their Maths teaching. They pointed to shared content and

teaching techniques - viz. law of moments, equations, calculations, graph drawing, reading tables.

6.2 SEP method: student participation and group work

Seven teachers (about a third) said that they had introduced more student participation in other classes. Four of these related to Maths, one to Business Economics, and with the remaining two it was not clear which subject was being referred to. Some answers were:

Practical work by the students has lately meant a lot. Letting the students try a mathematical problem on the board or piece of paper until they arrive at a certain conclusion thus formulating a rule on their own. (Maths)

I divided students into groups and give them different sums. They discuss and work it out in exercise books. (Maths)

It has become my habit to avoid telling pupils answers - I let them find answers on their own. (Maths)

It has helped me in Business Economics when I told my pupils to apply the knowledge that we were doing in class to the outside world in their daily life. This method of applying the knowledge I learned it from SEP.

One response is worth noting even though not linked to helping with a specific subject. It relates to the effects SEP has had on this teacher's perception of children with them:

The method of individualisation is emphasised in SEP because pupils' IQ is not the same so each and every child received attention. In that way the child develops according to his ability. He feels confident of knowing himself and of a subject.

It is clear from the above that the SEP method is having an effect beyond the three Science subjects, but that this does not extend much beyond Maths. None of the six teachers who had taught Afrikaans felt it had helped with this subject, though there is no reason why student participation in group discussions around, for

instance, comprehension exercises could not be introduced.

Nevertheless, a start has been made. We must be wary of being too optimistic about this result, based as it is on a fairly superficial self-administered questionnaire. MacDonald (1980) has shown how teachers' assessment of their own use of SEP methods differed substantially from objective observers' assessments - teachers rated themselves higher on such things as 'encouraging pupils to talk', 'responding positively to pupils' contributions', than did the observers.

Based on the above, it is suggested that the 1983 attitude survey taps this encouraging trend in more depth. It would be helpful, if time permits, for the SEP implementors to give teachers practical examples of how SEP methods could be used in non-scientific subjects such as languages and History. Alternatively, such a theme could be given particular attention during Zonal meetings.

7. TEACHERS AND PUPILS

We inserted a question relating to SEP's effect on pupils between the general attitude questions and the last section on the Zonal Programme. This was designed for light relief and to change focus away from teachers' attitudes for a moment.

The answers provide strong affirmation of the benefits to be gained by adopting a participatory, practical problem-solving approach to learning. It would be wise to point out here, once again, that the schedule was completed by only 20 of a possible 76 teachers. It is likely that those who responded felt more positive towards SEP; moreover, their participation in this survey might mean that they were more open than non-respondents to SEP's participatory methods in the classroom.

We predicted and received a 100% 'yes' response to the question:

'Do you think (joining the project) has increased your pupils interest in Science?'

We then went on to ask:

'If yes, can you explain what has made them more interested.'

Teachers particularly stressed the students' practical work igniting their interest, and their learning to solve problems on their own. This independent learning and stimulation of curiosity are high priorities for SEP organisers: the beginnings of critical thinking skills which are not generally fostered in the classroom.

Some representative responses were:

Pupils are now getting curious about what they were taught. You could find them teaching one another.

Feeling apparatus gives new life to the world of Science.

They are keener to find out things on their own which did not happen before SEP.

In SEP a problem is first posed and then is solved. By that, the pupils become curious. So if they come across a new thing they ask themselves lots of questions. If they fail to answer they come and ask.

In the last sentence of the last reply, the teacher shows the change in the nature of the interaction between pupil and teacher. The usual one-way communication channel has broken down. In other parts of this report, SEP's contribution to the increase in personal confidence, and confidence in teaching skills has been mentioned. Such confidence must surely be a prerequisite to breaking down the barrier of authority between teacher and pupil, as this barrier so often is a reflection of a teacher's insecurity.

In answer to the question on ways in which SEP had influenced teachers, one wrote:

It has cultivated an intimate relationship between me and the pupils. We work together as a team. Pupils have taken the lead in discussions and I merely guide them not spoonfeed them as before.

Now this might be a case of a teacher 'learning the SEP jargon' and reproducing it uncritically. MacDonald (*op. cit.*) has shown that there is a gap between teachers' and outside observers' perceptions of teachers performance (this same teacher was in fact critical and reflective in other parts of the schedule). The following comment, however, leaves one in no doubt that SEP has changed the nature of the pupil-teacher relationship for some teachers:

Mutual understanding between teacher and student has improved, because even if one is at a bus-stop Science students are always surrounding one and posing different questions concerning school work.

8. TEACHERS' MAJOR PROBLEMS

Teachers were asked two similar questions, the first towards the beginning of the schedule, and the second near the end. These were:

'Think back to the time before you joined the Project. What were the main problems facing you as a Science or Biology teacher then?'

'Think ahead to next year: what are the main problems facing you as a Science or Biology teacher in 1983?'

These questions were asked for two reasons:

1. It could be expected that problems would have changed from those to do with lack of any basic equipment, to a more complex or abstract level of problems. We wanted to know what this shift in emphasis was.
2. We wanted to get guidelines from teachers as to their present problems, so that SEP organisers could get feedback for planning

the 1983 programme. This was an indirect way of asking for criticisms of SEP, given that we knew that responses generally would probably lean towards the positive and uncritical.

The two questions were open-ended, and teachers responded to both in some detail, many giving three or four past and present problems.

Without exception, problems before involvement with SEP were located squarely 'in the classroom', as it were. Eleven teachers specifically mentioned the lack of apparatus; those who didn't mention it directly, referred to the difficulties of doing practical work. Lack of skill in preparing lessons and setting tests and exams were also cited. The answer given by one teacher is appealing, and seems to sum up the general range of problems:

Most of things were theory. It was not easy to teach Science. Most students hated Science like nobody's business.

In contrast, the problem of the lack of apparatus in 1983 has predictably almost disappeared (one person felt that Biology apparatus and specimens would be inadequate; another simply wrote 'apparatus' as a problem). The responses can be grouped as follows, and may hopefully provide pointers for the Zonal leaders and implementors during 1983:

1. Seven teachers foresee problems regarding worksheets: they may arrive too late, or there may be insufficient provided. This presumably reflects problems with worksheets in past years.
2. Four teachers are concerned about the repair of broken equipment or the replacement of used chemicals.
3. Four teachers are worried about their ability to plan the syllabus and prepare lessons.
4. Three teachers mention the large numbers of pupils in a class as a major problem. One attributes the increase in numbers

directly to SEP:

As our school is a Project school, more parents are sending their kids to our school and the enrolment will be high and we have no laboratory and moving desks is time-consuming.

Certainly a compliment to SEP, but one that seems to be creating another problem!

5. Anxieties concerning the Zonal Programme were cited by four teachers. These have been dealt with in the relevant section.
6. Three teachers express as their major concern the inroads that extra-mural activities such as choir and sport make on their formal teaching time. A further two mentioned 'school disturbances'.
7. Finally, a comment from one teacher:

One time you are a Science teacher, tomorrow you teach something else.

Though this problem is mentioned by one teacher only, SEP has encountered it on a number of occasions: SEP teachers have been allocated non-Science subjects, or have been transferred to schools outside the four SEP circuits, and contact is lost.

It can be seen that the first three response categories relate to the 'in the classroom' situation: they concern problems with SEP equipment and methods at a more detailed level than the 'problems before involvement with SEP' answers. The last three categories show a different focus of teachers' problems, to do with problems in black education generally.

9. THE ZONAL PROGRAMME

The Zonal Programme was introduced in the Durban area in July 1982. Schools are grouped into geographical zones, in each of which a Zonal Leader and deputy are elected by the SEP teachers. The implementors feel that this is a crucial step in providing an ongoing support structure for the Project, in which teachers can be involved in their own professional growth. They will take more responsibility for the planning and maintenance of the Project, a sense of ownership will be encouraged, and the implementors hope to have a lower profile role in future. The long term funding of the Project is not ensured, and through the Zonal Programme, teachers will be preparing for future independence.

The implementors were keen to get feedback about teachers' attitudes to the Zonal Programme at the end of its first half year of operation. Some direct questions were asked, and further information emerged through answers to open-ended questions.

The direct questions (Q16) were:

'The Zonal Programme has just started. Do you think this is a good step for the Project?'

'If you think it is a good step, could you say specifically why you think so?'

'Can you think of just one way in which you have benefitted by the Zonal Programme so far?'

Fourteen teachers (about two thirds) thought the Programme was a good step, one thought it was not (no reason given), three did not know, and two did not answer this question.

As expected, all the Project Committee members felt positively towards the Zonal Programme, with the exception of one who did not know.

As to why teachers felt positively, nearly all mentioned 'sharing of ideas', 'solving problems as a group', 'working together' - answers

which point to the usefulness of the Zonal meetings as a platform for co-operation where teachers can discuss common problems.

Some were more specific: four stated that the setting of a common examination paper had been useful, and working on the syllabus together was also mentioned.

Three teachers gave answers which point to the independence and 'sense of ownership' of the project that the implementors are hoping to foster:

It promotes teachers' self-confidence when working independently in their zones.

As Science teachers we learn to do things on our own.

It arouses a feeling in teachers that SEP belongs to them - each become responsible for contributions to it.

However, in another question (Q15) teachers were asked to respond to the statement:

'SEP belongs to the Science teachers who join it.'

It could be validly argued that this statement carries a high risk of misinterpretation by non-English speakers. 'Ownership' in the sense intended is not easily defined. Be that as it may, seven respondents agreed, eight disagreed, and four didn't know or felt neutral. It appears here that only a third of the teachers feel that SEP is 'their' Project.

On the other hand, another statement in Q15 read:

'The SEP implementors make too many decisions without consulting the teachers.'

Here, eighteen disagreed with the statement, one did not know or felt neutral, and one did not respond.

Taking the responses to both statements together, one may suggest that while teachers may not yet have a strong sense of 'ownership', yet they feel satisfied that they are consulted about decisions regarding the Project.

One may imagine that in any project of this nature, the transition to more independence and autonomy brings with it some anxiety about the ability to cope without the initial organisers or catalysts. This was reflected by four people in their responses to the question:

'What are the main problems facing you as a Science or Biology teacher in 1983?'

Their answers were:

Will Zonal Leaders be given time to visit schools?

People who will take the place of implementors giving lectures on chapters.

If Zonal Leaders show no insight in Science; failing to run Zonal courses; financing Zonal Leaders.

As long as the implementors will be around to correct us when necessary, I can foresee no problems. That is why we pray that they do not leave us any more.

These answers reflect some lack of confidence in the Zonal Leaders, compared to the implementors. Project organisers can perhaps be reassured that this is a typical response pattern in many development projects when the outside organisers start the process of withdrawal.

10. SUMMARY

A survey of teachers in the Science Education Project was undertaken in order to gauge their feelings and attitudes towards the Project and the newly introduced Zonal Programme. While the response rate to the self-administered questionnaire was relatively low, useful information has emerged which can guide the project organisers and Zonal Leaders in their planning and implementation.

The overall response to the Project was extremely positive. The results reflect the teachers' perspective on their own growth - the implementors may well assess that growth from a different perspective, in terms of Project goals and what their understanding of what a 'good Science teacher' is. However, from the teachers' point of view, it was shown that:

1. The teachers perceive a tremendous increase in their self-confidence through involvement with the Project, particularly regarding their confidence in doing practical work.
2. Their enthusiasm for, and interest in, Science has been sparked by the new approach to teaching.
3. While some stated that they are transferring the participatory teaching methods to their teaching of other subjects, this seems to be limited so far to the teaching of Maths.
4. Many teachers reported an improvement in the quality of the teacher-pupil relationship, and value the new interest in Science shown by pupils.
5. Before their involvement with SEP, teachers' problems with teaching Science revolved largely around the lack of apparatus and equipment. There has been a significant shift in the focus of their perceived problems: teachers are now concerned with syllabus planning and preparation, the Zonal Programme, and more general problems of black schooling.

6. Most teachers welcomed the introduction of the Zonal Programme. As far as this survey could establish, they do not as yet feel the sense of ownership of the Project which the implementors hope for, and some expressed reservations about the ability of the Zonal Leaders to take over from the implementors. Teachers appreciated the Zonal Programme mostly in terms of its being a forum for discussion, and joint work on practical tasks such as setting tests.

Recommendations regarding practical steps which could be taken by the implementors and/or Zonal Leaders have been given in the body of the report. Indications are also given of areas which could be explored more fully in the forthcoming in-depth survey of teachers' attitudes.

11. CONCLUDING COMMENTS

In this final section, I wish to make a few concluding comments arising from the survey and my involvement with the Project. I take the license of stepping outside the role of 'objective evaluator', and offer some opinions of my own.

- The survey results make quite clear that the teachers who responded are overwhelmingly grateful that they have obtained, through SEP, scientific materials and equipment. The objectives of the organisers have gone beyond this level of provision: they are now more concerned with 'higher order' aspects such as encouraging 'ownership', structures ensuring the long term survival of the Project, and concern that the processes of Science are not as yet fully understood by teachers and pupils alike. However, they should not underestimate the importance to teachers of this provision of hardware.
- I imagine 1983 could be a difficult period of transition, as the Zonal Programme develops. The implementors have invested a great deal of effort in getting the Project accepted by the education authorities. They hold a position of trust vis-a-vis these authorities and the school principals. Now an increasing responsibility for planning and maintenance is being taken over by the Zonal Programme. It is to be expected that the Leaders may in time want aspects of the Project to take a different direction to the initial objectives and goals of the organisers. They may have a different set of priorities regarding the functions of Zonal Meetings. There will be areas of stress and conflict, but it is my impression that the implementors have developed a relationship of trust and openness with the teachers that could facilitate dealing with such conflict.

- SEP in KwaZulu has been faced with a problem that has not been clearly reflected in this survey report. SEP teachers have been allocated to non-Science subjects, or have been transferred to schools outside the four SEP circuits. Later on, as teachers become more skilled in, and confident about, the new teaching methods, they may well be able to transfer their skills to other subjects, or to Science in other schools. In this way SEP's influence could be dispersed positively. At this stage, however, when both teachers and implementors are aware of the need for ongoing, relatively intensive mutual contact, such moves mean a serious waste of input.
- The influence of SEP on teachers' confidence, and on their perceived ability to organise events outside the classroom and to act as committee members, have been noted in the report. It was also noted that many of the major current problems reported by the teachers relate to difficulties in the education system in general, and not specifically to the teaching of Science. Is it being too optimistic to anticipate the possibility of SEP teachers, with their growing confidence and their new leadership skills, forming the core of a group of teachers who might start acting to try and resolve some of these broader problems?
- SEP is at present restricted to operating in four educational circuits, in and near Durban. This survey, and others, show that it has been welcomed, and has filled a real need: students' marks have improved, students' and teachers' attitudes to Science are more positive, the teachers have become more involved in their own professional growth.

The need for such a Project in urban areas is unquestionable: how much greater the need must be in rural schools! Constraints of time, money, and organisational infrastructure too often mean

that pioneering, innovative projects such as this concentrate on urban areas only, thus increasing the gap in educational opportunities between urban and rural people.

In 1982 the implementors established contact with, and introduced materials to, one school in the far north of KwaZulu. I hope very much that this outreach into rural areas can be built on in the years ahead.

SCIENCE EDUCATION PROJECT:
TEACHER SURVEY 1982.

1. How many years have you been teaching? _____

2. For how many years have you taught:

General Science _____

Physical Science _____

Biology _____

3. In 1982 what subjects did you teach, and to which standards? Please tick in the correct columns.

	Std. 6.	Std. 7.	Std. 8.	Std. 9.	Std. 10
General Science			////	////	////
Physical Science	////	////			
Biology	////	////			

4. What subjects apart from these did you teach in 1982?

5. If you teach more than one subject, would you say which subject or subjects you most enjoy teaching?

Why? _____

And which subject or subjects do you like teaching least? _____

Why? _____

6. When did you first get involved in the Science Education Project?

(Tick one)

1980	1981	1982
------	------	------

When did your school first get involved in the Project?

(Tick one)

1980	1981	1982
------	------	------

7. Are other teachers in your school also involved with the Project?

8. Are you a member of the Project committee? _____

9. Please think back to when you first heard you were to join the Project.
What did you think about it?
What did you look forward to about it? _____

What made you unhappy about it? _____

10. Now that you have been working with Science Education Project, is it what you thought it would be when you first heard about it?

If the answer is No, can you say in what way it has been different to what you thought it would be? _____

11. Again, think back to the time before you joined the Project. What were the main problems facing you as a Science or Biology teacher then?

12. This might be a difficult question to answer, but please try! Has the method of teaching you have used with SEP helped you with your teaching of other subjects? _____

If the answer is yes, could you give some examples of how it helped in other subjects (use the back of the page if necessary).

13. Please mention three ways in which you think SEP has affected you.

1. _____
2. _____
3. _____

15. Most of the questions you have answered so far have been about your thoughts as a Science teacher. Now, about the pupils you have been teaching using SEP materials and guidance:

Do you think joining the project has improved your pupils Science marks? Please tick.

Yes	No	Don't know	No difference
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Do you think it has improved the pupils interest in Science? Please tick.

Yes	No	Don't know	No difference
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If the answer is yes, can you explain what has made them more interested?

16. The Zonal Programme has recently started. Do you think this is a good step for the Project? Please tick.

Yes	No	Don't know
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If you think it is a good step, could you say specifically why you think so? -----

Can you think specifically of just one way in which you have benefitted by the Zonal Programme so far? -----

17. Think ahead to next year: what are the main problems facing you as a Science or Biology teacher in 1983? -----

18. Could you finally just complete these simple questions: mark the correct boxes with a tick.

Age:	20 or less	21-25	26-30	31-35	36-40	41-45
		46-50	51-55	more than 55		

Sex: Male Female

What was the last standard in which you passed:

Biology: _____

Physical Science: _____

Which teacher diploma do you have:

P.T.C. _____

J.S.T.C. _____

S.S.T.C. _____

S.T.D. _____

Other (Please specify _____)

Was Science one of the specialities in your teaching diploma?

Thank you very much for filling in the questionnaire.

Centre for Applied Social Sciences
University of Natal
King George V Avenue
Durban
4001

TELEPHONE: 25-3411, 25-6373

22 November 1982

Greetings!

The Science Education Project has asked me to do a study of how teachers involved in the study are feeling about it. I work for the Centre for Applied Social Sciences, University of Natal. The Centre is often asked to do studies like this for other organisations.

As you know, the Project is still quite new, and the staff need to know more about how useful the work has been, what things should be improved and changed, and what things should stay the same.

Also, now that the Zonal Committees have been formed, SEP will be run more and more by them, and they will need feedback from the teachers on how best to run the Project.

I would therefore greatly appreciate it if you would complete the questionnaire and return it in the enclosed envelope as soon as possible, and not later than 30th November 1982. I am sorry it is such short notice, and that I cannot interview you personally, but we want to catch you before the holidays so we can write a report for the New Year.

There are some important points about the questionnaire:

1. You will notice that your name does not appear anywhere on the form. I will have no way of knowing which particular teacher sent in which form. This is to encourage you to write openly and frankly about your attitudes. We want to know what SEP teachers as a whole think about the Project.

2. This type of research is called a self-administered questionnaire: the person (the teacher in this case) is not interviewed personally, but fills out the forms him or herself. There are two main problems with this type of research:

....sometimes questions are not understood properly. Please phone me at 25-3411 ext. 366 at any time if you are not sure about what a question means. Leave a message if I am not there and I will contact you.

....sometimes there is a low response rate - many teachers might not complete and return the forms. If the motivation of the people in the study is high, the response rate is good. After discussion with Brian Gray, I have every reason to believe the response rate from you will be good: it is your project and by filling out the questionnaire improvements can be made which will benefit you and your pupils.

When the report is written you will be able to see it. I am sure you would be interested to see how all the SEP teachers feel about the questions that are asked.

So may I ask you please to complete the form - it should take less than an hour - and return it before 30th November 1982. I look forward to receiving your reply.

Best wishes to you and your family for Christmas, a prosperous New Year, and I wish you an interesting and rewarding Science teaching year in 1983!

Yours sincerely,

Francie Lund

Miss Francie Lund

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