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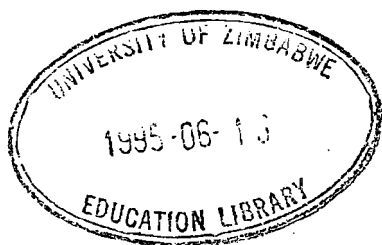
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Tracer Study Of The Zimbabwe Science Teacher Training Project

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ABSTRACT

Evidence from a tracer study of Bachelor of Education graduates from the Department of Science and Mathematics Education over the period from 1986 through 1990 is presented in this paper. The main findings were:

- 1. The group were experienced teachers with 5 to 10 years experience on average. The majority had less than five years experience in their present schools and about one third of them had spent less than one year in their present positions. Most of them held positions of responsibility.*
- 2. Very few of the respondents were teaching A-level. More former Chemistry students were teaching A-level than any other group while fewer former Biology students were teaching A-level than any of the other groups.*
- 3. Most of the respondents felt that the content courses had equipped them well for their present positions. They were less positive about education courses but still felt the education courses had equipped them well for their present positions.*
- 4. Many respondents recommended the introduction of an educational administration course in their programme.*
- 5. Most respondents felt the course was very good just as it stood.*
- 6. Headmasters considered the B.Ed. teachers to be useful and well trained and making positive contributions to their schools.*

Background Of Project

The massive expansion in the Educational System in Zimbabwe that occurred shortly after independence led to a shortage of trained science and mathematics teachers. One way of meeting the need for more university trained science and mathematics teachers was to upgrade the non-graduate trained science and mathematics teachers. The upgrading of teachers is under the auspices of the Faculty of Education in conjunction with the Faculty of Science and the Netherlands Organization for International Cooperation in Higher Education (NUFFIC). The programme involves the collaboration between the University of Zimbabwe (UZ) and Free University of Amsterdam (VUA) in the Netherlands. The project is entitled the Zimbabwe Science Teacher Training Project (ZIMSTT). The project assists the Faculty of Education in conjunction with the Faculty of Science of the University of Zimbabwe in mounting and implementing a programme in Science and Mathematics content and Curriculum Studies, leading to a Bachelor of Education degree in the field of Science: the B.Ed. (Science) degree. The general objective of the programme is to improve the quality of the teachers of Science and Mathematics at high school level in Zimbabwe.

ZIMSTT Project

Phase one of the project started in 1986 for two subjects: Biology and Physics. The following year two more options - Chemistry and Mathematics were introduced. The course under Phase one was a one year intensive programme. Phase one ended at the end of 1988. For Phase one, there were three intakes for Biology and Physics, and two intakes for Chemistry and Mathematics. Under Phase two the course duration was increased by one year as it was felt that the programme under Phase one was too intensive and both lecturers and students felt that the time was insufficient. More content was added. In the initial stage there were two lecturers for each subject-area (one each from Nuffic and one each from University of Zimbabwe) plus one curriculum specialist from the University of Zimbabwe. By the later stage of Phase two there were three lecturers in biology, chemistry and mathematics and two in physics with only one of these paid by Nuffic and the other ten paid by the University of Zimbabwe. Under Phase two, one intake has graduated.

Purpose of the Tracer Study

The general objectives of the tracer study are as follows:

1. to determine the contribution of the B.Ed. full-time programme to the quality of teaching science and mathematics at the secondary level;
2. to determine the contribution of the B.Ed. full-time programme at the tertiary level (teacher training colleges and polytechniques);
3. to determine weaknesses of the programme and suggest how it might be improved.

Methodology

The methods employed in this tracer study draw on quantitative and qualitative data collection techniques. We have taken the view that we wished to gain the views of all former B.Ed. Science and Mathematics students. All former B.Ed students (234) were included in the sample with 104 returning questionnaires. In addition interviews were carried out with subsample of 48 former B.Ed. students (who also completed the questionnaire) and ten headmasters.

Questionnaire Findings

One hundred and four out of 234 former B.Ed students returned their questionnaires (a 44,4% return rate). Fewer former mathematics students returned their questionnaires than any other group. Of those responding the majority (at the time of responding) had between 5 and 10 years of experience, another 32% had between 2 and 5 years experience while only 9% had more than 15 years experience.(See Table 1.)

Twenty-four out of 74 former Biology B.Ed students returned their questionnaires. Of those responding 50% had between 5 and 10 years experience with only 4% having more than 15 years experience. Unlike the overall group a fairly high percentage(29%) had 10-15 years teaching experience.(See Table 1.)

Table 1
Years Of Teaching Experience By Percentage
Of Those Responding

NUMBER OF YEARS	Overall		Biology		Chemistry		Physics		Maths	
	F	%	F	%	F	%	F	%	F	%
2-5 Years	29	33	4	17	10	30	9	35	6	33
5-10 Years	32	46	12	50	3	9	7	27	10	55
10-15 Years	31	16	7	29	14	42	9	34	1	06
more than 15 Years	9	5	1	4	6	18	1	4	1	06
TOTAL	104	100	24	100	35	100	26	100	19	100

Note: Percentages are of those responding to the item. There were three non-responses

It is apparent that many of the teachers have transferred schools frequently with 79% of them indicating less than 5 years experience in their present schools. There are however 21% who have more than 5 years experience in their present schools indicating that they returned to their former schools after completing the B.Ed programme. The Biology group which seem to have been the most stable with 35% having spent more than five years in their present school may merely be reflecting their greater experience and age and also the somewhat lesser demand for additional Biology teachers. Among the mathematics teachers there seems to have been considerable mobility with 55% of these teachers reporting less than 2 years in their present school. Again this may merely be a reflection of their lesser experience as the mathematics teachers tended to be younger. The Physics group reported the lowest percentage of teachers having spent more than five years in their present school (12%) and this may be an indication of greater demand for Physics teachers which makes the group more mobile. (See Table 2.)

Table 2
Years In Present School

NUMBER OF YEARS	Overall		Biology		Chemistry		Physics		Maths	
	F	%	F	%	F	%	F	%	F	%
Less 1 year	28	28	5	22	10	30	7	28	6	33
1-2 years	12	12	2	8	3	9	3	12	4	22
2-5 years	38	39	8	35	14	43	12	48	4	26
more than 5 years	21	21	8	35	6	18	3	12	4	22
TOTAL	99	100	23	100	33	100	25	100	18	100
	5	NR	1	NR	2	NR	1	NR	1	NR

Note: Percentages are of those responding to the item.

In terms of time spent in their present position 34% of the respondents had spent less than one year in their present positions and only 15% had spent more than 5 years in their present positions. The Physics group had the fewest members who had spent more than five years in their present positions (8%) while the mathematics group had the greatest percentage spending more than five years in their present position (21%). At the same time the mathematics group also had the greatest percentage who had just obtained their present position (48% spending less than one year in their present positions. (See Table 3.)

Table 3
Years In Present Position

NUMBER OF YEARS	Overall		Biology		Chemistry		Physics		Maths	
	F	%	F	%	F	%	F	%	F	%
Less 1 year	35	34	7	29	11	32	8	31	9	48
1-2 years	19	18	6	25	6	18	6	23	1	5
2-5 years	34	33	7	29	12	35	10	38	5	26
more than 5 years	15	15	4	17	5	15	2	8	4	21
TOTAL	103	100	24	100	34	100	26	100	19	100
	1	NR			1	NR				

Note: Percentages are of those responding.

Of the 104 respondents 35 were from Chemistry, 24 from Biology, 26 from Physics and only 19 from Mathematics (Table 4).

Table 4
Subject Taken At B.ED. Level

Subject	Frequency	Percent
Biology	24	23
Chemistry	35	33
Mathematics	19	18
Physics	26	25
TOTAL	104	100

Subject Taken At B.Ed Level

Most of the respondents (81%) were from the last two intakes (Table 5).

Table 5
Year(s) Of Attendance For B.Ed

Years (s)	Frequency			
	Biology	Chemistry	Physics	Maths
1986	0	0	2	0
1987	2	10	4	1
1988	16	15	8	7
1989-90	5	8	12	11
No Response	1	2		
TOTAL	24	35	26	19

Of the 104 teachers responding 88% held positions of responsibility. Seven percent were school heads (most of these came from the Biology and Mathematics groups), 32% were department heads (this was true most frequently for Biology and Physics), 22% were lecturers in teachers' colleges (the largest number coming from Chemistry followed by Physics and Mathematics), 29% were teachers and 10% held other responsibilities. (See Table 6.)

Table 6
Type of Position of Responsibility

TYPE OF POSITION	Overall		Biology		Chemistry		Physics		Maths	
	F	%	F	%	F	%	F	%	F	%
School Head	7	7	3	15	1	3	1	4	2	12
Lec TTC	21	22	2	10	10	30	6	23	3	18
Teacher	28	29	3	15	17	52	3	12	5	29
Dept. Head	31	32	10	50	4	12	12	46	5	29
E.O.	5	5	1	5	2	6	2	8	0	0
Other	5	5	1	5	2	15	2	12	2	11
TOTAL	97	100	20	100	34	100	26	100	17	100
	7	MISS	4	MISS	1	MISS			2	MISS

Note: Percentages are of those responding to item.

Of all the respondents only 23% were teaching A-level classes, whereas 41% were teaching O-level classes. Those teaching Chemistry formed the largest group who were teaching A-level (40% of the Chemistry group) whereas only 8% of the Biology group were teaching A-level. Twenty-three percent of the teachers were in teachers' colleges with 10% being found in primary teachers' colleges and 13% in secondary colleges. The Chemistry and Mathematics groups formed the greatest number teaching in teachers' colleges. Five of the former students had become education officers (EO) and eight had been made school heads. Of those teaching in teachers' colleges only 58% were teaching their B.Ed subject. (See Table 7)

Table 7
Level Being Taught

NUMBER OF YEARS	Overall		Biology		Chemistry		Physics		Maths	
	F	%	F	%	F	%	F	%	F	%
A-Level	24	23	2	8	14	40	5	19	3	16
O-Level	43	41	14	58	9	26	11	43	9	47
Primary TC	10	10	1	4	5	14	2	8	2	11
Secondary TC	14	13	3	13	4	11	4	4	3	15
Head	8	8	3	13	1	3	2	8	2	11
E.O.	5	5	1	4	2	6	2	8	0	0
TOTAL	104	100	24	100	35	100	26	100	19	100

Teachers averaged 15 hours per week teaching their subject at A-level and 19 hours per week teaching their subject at O-level. The range of hours at A-level was more limited and 75% of the teachers taught A-level less than 18 hours per week while for O-level the hours increased to 21 per week. (See Table 8.)

Table 8
Hours Spent Teaching Secondary Level

Hours Per Week By Percentile									
LEVEL	10		25		50		75		90
A-Level	2		5		15		18		23
O-Level	5		12		18		21		111

Student Opinion Concerning Course

Table 9
Student Opinion Concerning Course

STATEMENT	Strongly Agreed		Agreed		Neutral		Disagree		Strongly Disagree	
	F	%	F	%	F	%	F	%	F	%
Content equipped me well to teach A-Level	17	55	13	42	1	3	0	0	0	0
Education equipped me well to teach A-Level	6	20	15	50	6	20	3	10	3	0
Content equipped me to teach O-Level	44	49	29	33	10	11	4	5	2	2
Education equipped me well to teach O-Level	27	30	35	39	24	27	3	4	0	0
Content equipped me well to teach in TC	15	68	5	23	1	5	1	5	0	0
Education equipped me well to teach in TC	8	38	8	38	1	5	4	19	0	0
Content equipped me well for position of responsibility	22	41	23	43	7	13	2	4	0	0
Education equipped me well for position of responsibility	15	29	25	46	10	18	4	8	0	0

Of the 31 teachers responding (only those currently teaching A-level) 55% strongly agree that the content courses they studied in the B. Ed programme equipped them well for teaching A-level classes. A further 42% agree with the statement thus showing that 96% of the students found the content appropriate for their needs as A-level teachers. (See Table 9.)

In relation to the education courses they studied these former students were not nearly as positive. Only 20% strongly agree with that statement and 10% felt that it had not been useful. Even so about 70% felt the education courses had proved helpful and only 10% felt it had not been useful with 20% remaining neutral (Table 9).

Of the 89 teachers responding (those currently teaching O-level) 49% strongly agree that the content courses they undertook equipped them well for teaching O-level classes. A further 33% agreed with the statement thus 82% found the content appropriate to their needs as O-level teachers (Table 9).

When it came to the education courses 30% strongly agreed that the education courses were adequate to their needs with another 39% agreeing making 69% who found the education component adequate to their needs. Of the remaining respondents 27% were neutral with only 4% feeling that the course had not met their needs (Table 9).

Of the 22 teachers responding (those currently teaching in teacher education programmes) 68% strongly agree that the content had met their needs with a further 23% agreeing with the statement thus 91% felt the content courses were useful to them in teacher education (Table 9).

Again the teacher educators were not as positive towards the education courses with 38% strongly agreeing that the education course had met their needs in teacher education. A further 38% agreed with the statement but note that 19% felt that it had not met their needs (Table 9).

For the 54 teachers in positions of responsibility 84% found the content courses had met their needs in their new positions and 75% felt the education courses had met their needs (Table 9).

Suggestions for Improving the Course

The teachers were asked to indicate ways in which the course might be improved. Their suggestions included the following:

1. Introduce educational administration courses (Six respondents recommended this).
2. The programme could be lengthened to three years (Four respondents recommended this).
3. Include computer use in education (Five respondents recommended this improvement.) (a step which has already been taken at this point).
4. The focus should be on A-level and Teacher Training. (This was recommended by two respondents).
5. There should be a focus on the teaching of the content as well as the content itself. (Six respondents made this recommendation.) Note here that a course on teaching A-level already exists and it appears that the respondents are actually recommending that this be given greater emphasis and weighting.
6. All the three science groups (Physics, Chemistry and Biology) had members (7 members) who recommended the inclusion of more practicals.
7. All the three science groups (4 respondents) recommended the deepening of the education component.
8. All groups had persons (11 respondents) who commented that the course was very good just as it stood.
9. All groups had persons (5 respondents) who recommended that an M.Sc. programme be started (this has also already taken place).

Interview Findings

Procedure

Using stratified random sampling techniques, a subsample of forty-eight former B.Ed. students were interviewed. They were from thirty-two secondary schools and four teacher training colleges and one technical college. Of the interviewees, 12 attended the 1987 course, 18 the 1988 course and 18 the 1989-90 course. Each discipline was represented by 12 interviewees. Of the 48 interviewees, 38 are teachers in secondary schools, 9 lecturers at teacher training colleges and one at a Polytechnic college. Of the 38 teachers, six are deputy heads and 18 are department heads or acting heads. Eighteen of the teachers are teaching 'A' level classes. In addition, ten headmasters were interviewed.

The 48 former students were asked to comment on:

- a) the quality and relevance of the courses
- b) classes they are teaching
- c) what they think of the programme.

The ten headmasters were asked to comment on:

- a) the quality of teaching by former B.Ed. students
- b) their contribution to the school as a whole
- c) what they think of the programme as seen from the products of the programme

Former Student Interview Findings

Biology

The interviewees who had attended the 1987-1988 Biology programme (6 interviewees) were positive about its science content. They regarded all the courses useful. However, the 1989-1990 course participants (6 interviewees) felt that Animal Physiology - ESMB 203 and Ecology - ESMB 203 were rather difficult.

Chemistry

The interviewees who had attended the 1987 and 1988 programme (6 interviewees) considered the courses offered useful. Some regarded Further Organic Chemistry as rather difficult but they felt that the lecture notes provided by the lecturer were very useful.

Two interviewees were very negative about Inorganic Chemistry and Analytical Chemistry. The interviewees who had attended the 1989-1990 programme were very positive about its science content. They felt that the content courses are well balanced. The interviewees also felt that the various options offered at 'A' Level such as spectroscopy, food chemistry, soil chemistry, biochemistry, polymer chemistry should be included in one of the content courses.

Mathematics

All the interviewees felt that Calculus with Analytical Geometry should not be treated as pre-requisite but as one of the content courses. Note that in Phase one prerequisite courses were not examined in the same way as the other content courses but that in Phase two pre-requisite courses are weighted and examined the same as other content courses. Three interviewees who had 'A' levels felt that 'A' level experience helped them a lot. The content was not too difficult for them. The other interviewees (9) felt that Introduction to Linear and Abstract Algebra was a very difficult course. Some of the interviewees felt that the tutorials were not well organized and did not help in reinforcing what was covered in the lectures.

Physics

The interviewees (12) were positive about the content courses. They felt that the content courses are relevant. Three of the interviewees felt that the Mathematics and Computing course which was a prerequisite course was treated rather superficially.

The Education Courses

The interviewees were rather divided. Those who are under the Ministry of Education and Culture (38 teachers) felt that the courses were not relevant to 'A' level teaching since they lacked the practical component. The interviewees who are lecturers (9) at teacher training colleges and those pursuing masters studies (10) claimed that the educational courses are useful. Two of the interviewees suggested that in addition to Science Curriculum Theory a general curriculum theory component should be added to the educational courses.

Refresher Courses

When the interviewees were asked about the need for refresher courses, those teaching 'A' level indicated that it was a welcome suggestion. They, however, suggested that such refresher courses should be manned by subject specialists and that the optional areas in the 'A' level syllabuses should be covered. All the interviewees agreed that the B.Ed. programme is very useful.

Headmasters

Ten headmasters were interviewed - two in Mashonaland East, two in Harare Region, two in Masvingo Region, two in Midlands and two in Matabeleland North.

The interviews with headmasters started by a general discussion about the school. All of the headmasters were candid and very frank when asked about the B.Ed. programme in general. Most of the headmasters agreed that the full-time programme was an improvement on the three year part-time programme. One of the headmasters said that the three year part-time programme was not properly planned and its products were not

well prepared in terms of content. He even suggested that refresher courses would help such teachers. On the full-time programme, some headmasters felt that a year was a very short time to do all the B.Ed. courses. When told that the programme was now two years, they felt that it was an improvement, but, according to them, three years was an ideal period.

With regards to the performance of the former B.Ed. students, on the whole, the headmasters interviewed felt that they were an asset and contributed positively to the school. However, some headmasters felt the B.Ed. teachers wanted to go back for masters studies before they had made their contribution.

One of the headmasters indicated that one of the former B.Ed. students is deputy headmaster at his school. He went on to say that she is a capable deputy and each time he is out he knows that the school is in good hands. Similar sentiments were expressed by another headmaster in Masvingo Province about the former B.Ed. student who is his deputy. At yet another school visited a former Biology B.Ed. student is the deputy headmaster and is responsible for the master time table and most of the routine duties. The head master at that school is very impressed by this teacher's abilities.

Those headmasters who head schools where some of the former B.Ed. students are heads of departments indicated that these teachers were doing a good job in running their departments. Some of these heads of departments also teach 'A' Level classes. For example, the head of department at St. Francis of Asisi Secondary School and the head of department at Manama Mission teach 'A' level classes. Their 'A' Level results have been good with their students obtaining a better pass rate than previously (50% pass rate compared with previous pass rate of only 33%).

Overview

Most of the former B.Ed. students went back to their old schools after graduation. Some of these schools have no 'A' Levels for example Chimhau in Murewa. Nearly all of the teachers interviewed are married. About 10% of those interviewed are working in their home areas.

Most of them spoke highly of their headmasters and expressed a desire to continue at the same school. Two of the interviewees felt that their school (both are at the same school) was too far from the nearest town. They felt

that they didn't have the opportunity of interacting with other former B.Ed. students. Two of the interviewees felt that they were underutilized since they were not teaching 'A' Level.

From the interviews, it is very clear that this programme is very useful. There is, however, room for improvement in terms of strengthening the content. Since some of the former B.Ed. students end up being administrators, it may be useful to include a component of administration in the education courses. Such a component could be taught by lecturers from the Department of Educational Administration. It is also apparent that most of the former B.Ed. students would prefer to be employed by the Ministry of Higher Education. The main reason being that the conditions of service and the reward system are much better.

Summary And Recommendations

The course sought to increase the quality of teachers of Science and Mathematics at the high school level in Zimbabwe. The tracer study sought to find how well the programme had succeeded in producing high quality teachers for both secondary and tertiary level. It also sought to find areas where the programme needed refinement.

The Bachelor of Education group were experienced teachers with an average of 5 to 10 years experience. The majority had less than 5 years experience in their present schools and about one third of them had spent less than one year in their present positions. Most of the respondents held positions of responsibility.

Very few of the respondents were teaching A-Level. More former Chemistry students were teaching A-Level than any other group while fewer former Biology students were teaching A-Level than any of the other groups. This certainly is a point of concern as the purpose of the programme was to produce A-level teachers of science and mathematics and the finding suggests that the former students are not being deployed to best advantage for this purpose. This said, however, it does seem that their improved content knowledge and teaching skills are still being put to use in their schools.

Most of the respondents felt that the content courses had equipped them well for their present positions. They were less positive about education courses but still felt the education courses had equipped them well for

their present positions. In all subject groups both content and education courses were seen as useful. Those teaching A-Level seemed to find both the content courses and the A-Level method courses as more valuable to them than did those teaching other levels.

Many of the respondents recommended the introduction of an educational administration course.

Many respondents recommended the inclusion of computer use in education. This is a step which has already been taken. The present group of students are receiving instruction in computer literacy and use of computers in education.

Many respondents suggested lengthening the course to three years.

Many respondents recommended the focus should be on A-Level and Teacher Training. They said the focus should be on teaching of the content as well as the content itself. They recommended a deepening of the educational component by giving an initial general curriculum component followed by specific science and mathematics curriculum theory components.

Inclusion of more practicals was recommended by all three of the science groups (Biology, Chemistry and Physics).

Most respondents felt the course was very good just as it stood.

Many respondents recommended that an M.Sc. programme should be started. This has already taken place with intakes in Mathematics in 1990 and in two of the Science areas in 1991.

Headmasters considered the B.Ed. teachers to be useful and well trained and making positive contributions to their schools. Those teaching A-Level were producing students who achieved good results. Two headmasters who were interviewed said there had been significant improvement in A-Level results in the relevant subjects in their schools since they had B.Ed. teachers.

Recommendations

There should be a common general course in curriculum for all four options. These should be a half course which should be taught before a second specialized curriculum course by subject area which should also be a half course. This would help with the staffing problems and at the same time provide a course which better meets the needs of the students.

A course in Educational Administration should be introduced. Many former students have ended up in administrative posts and need some basic ideas related to educational administration.

When the students complete the course they should be placed in A-level schools. The greater percentage of the former students are presently teaching in non-A-level schools. Yet, their training was specifically for A-level. This appears to be a misuse of skilled manpower. At present many expatriate teachers are recruited for these specialized posts for which these particular Zimbabwean teachers have been specifically trained.

A number of the former students while feeling that the two year programme was an improvement on the previous courses felt that it needed to be made a three year programme. This does not seem very feasible in light of current manpower needs. A more viable alternative would be the mounting of refresher courses particularly in new option areas (of course, it would be necessary that subject specialists in these areas be available to teach these options). The refresher courses could be mounted over 1 or 2 weeks during school holidays.

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