

Report to the Manpower Services Commission
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***Recruitment to Maths and Physics Teaching:
a personality problem?***

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SUMMARY

Reactions to teaching as a career were generally unfavourable. Only one per cent of the young men and 12% of the young women were strongly attracted and for 19% of the young men and 17% of the young women it was seen as the 'last resort'. Women tended to more attracted to teaching than men.

Some three-quarters of the young men and 69% of the young women rated it high on person-orientation, but only 2% of the young men and 5% of the young women did so for material rewards. Poor salary was mentioned by about a quarter of the young men and a sixth of the young women. Concern for a fair return completely over-shadowed the question of whether they thought they were suited to teaching.

Regarding the attractions and drawbacks of teaching, 27% of the young men and 15% of the young women felt that teaching had no attraction for them at all. The pupils were put forward as both the strongest reasons for wanting to enter and to avoid the profession. On the one hand, the pleasures of 'helping people/see them learn' against 'discipline/attitude of pupils' making life difficult.

About an eighth of the young men and a fifth of the young women who had studied some science at A-level expressed interest in the proposed science education degree. Even some of those who had taken no science at A-level seemed attracted to it. There were indications elsewhere in the data that not everyone who had given up the sciences was pleased to have done so.

The new degree was seen as appealing particularly to those who wanted to teach science, but lacked the inclination to study pure physics or maths degrees. But reservations were expressed about the early commitment to teaching that it would imply.

The conclusion reached is that the proposed degree would be viable, but some of the recruits would be diverting from other routes rather than adding to the overall pool. Recruitment to maths and physics teaching is only part of a wider problem which is how to make teaching once again an attractive profession.

I. A SOLUTION TO A SEEMINGLY INTRACTABLE PROBLEM?

A major difficulty in recruiting sufficient numbers of physics and maths teachers may be that the satisfactions provided by teaching are not those sought by science specialists (Smithers, 1969). In particular, teaching is primarily a 'person-oriented' profession (Rosenberg, 1957), while those attracted to the abstractions of physics and mathematics may have little interest in working with young people. In order to increase the supply of teachers in these subjects, it may be necessary, therefore, to provide a different means of entry to the profession to broaden the range of potential entrants.

An increasing number of sixth-formers are taking mixed A-level courses, combining science subjects with non-sciences. In 1985, the 30 per cent taking such courses was above that for the straight sciences. The reasons for the popularity of mixed combinations are currently being investigated (Smithers and Robinson, 1986a), but some of those doing so have good O-levels in physics and mathematics (Smithers and Robinson, 1986b), so it cannot be said that they are for weaker students. In personality terms, those taking them have been found to be more 'people-oriented' than those taking the straight sciences (Smithers, Collings and McCreesh, 1984), suggesting they could be an untapped source of science teachers. Their A-level combinations, however, are not always acceptable to science departments.

The Department of Education at the University of Manchester is currently considering whether to introduce a degree leading to qualified teacher status in which science subjects taught in the science departments would be studied alongside education. This report assesses the interest in such a degree course among young people based on a sample who had been interviewed in both the lower-sixth and the year after taking A-levels.

II. MEETING THE YOUNG PEOPLE

As part of a study of the growth of mixed A-level courses, in 1985, 229 first-year sixth-form pupils, ten from each of 23 schools (apart from one pupil who did not turn up) were interviewed. Since this was a carefully assembled representative sample comprising boys and girls from each of the subject groupings 'science and maths only', 'other subjects only' and 'mixed courses', the reactions of these young people to the proposed Science Education degree can be taken as an indication of what the general response would be.

Attempts were made to re-contact as many of the original sample as possible through the schools. For confidentiality, two of the schools did not provide the names of pupils at the time of the original interviews, so twenty were not traceable. Of the remaining 209, one sadly had died, and for 16 others no addresses were available because they had either changed schools before completing their A-level courses or had moved afterwards.

The target sample thus became 192 and, for this, attempts were made to contact by telephone either the young people themselves or their parents to locate them. In this way, addresses in Britain were obtained for 141. A further seven were found to be living abroad. Two young women were working as au pairs in Germany, and another in Norway. Another young woman was at the University of Turin. One young man was in the army in Germany, another was taking a year before going to university to train with a lawyer in Paris, and the last of the seven was in Australia. A questionnaire derived from the interview schedule was sent to all seven.

Forty-four of the 192 could not be traced by telephone either because their parents did not have one or because the number was ex-directory or because the British Telecom dispute during February meant that the numbers were unobtainable. A letter was sent to all 44 explaining the project and requesting a point of contact so that an interview could be arranged. Three weeks later a second letter was sent to those who had not yet replied. Initially, four of the letters were returned 'address unknown', but once the Telecom dispute was settled we were able to telephone the parents of three of these

young people and obtain correct addresses. By the end of March a total of twenty-three replies had been received. Of these, one young person did not wish to be interviewed but later agreed to complete a questionnaire. As a final attempt to make contact, questionnaires were posted to the twenty people who had not replied in the hope that their lack of response was due only to a reluctance to be interviewed.

In all, we were able to approach 163 of the original sample for interviews - 141 from the initial inquiries, and 22 from letters or telephone inquiries made after the ending of the dispute. Fourteen questionnaires were received - four from the seven young people abroad and ten from the young people in Britain. The final sample therefore totals 177, a response rate of 92%. The make-up of the sample is shown in Table 1:

Table 2.1: Final Sample

Sex	A-Level Subject Combination			Total
	Mixed	Science Maths	Other Subjects	
Male	37	28	29	94
Female	35	24	24	83
Total	72	52	53	177

During the first interviews in 1985 we were able to build up a good picture of the students' aspirations and expectations in relation to their backgrounds and what they are studying at school. In this follow-up study we were concerned to discover:

- a) what the young people were actually doing now, two years later;
- b) their reactions to their school experiences;
- c) their occupational and life values;
- d) their attitudes to teaching as a career,;
- e) their beliefs about the satisfactions provided by teaching;
- f) their interest in a broader degree;
- g) their interest in a degree combining science/maths with education;
- h) whether such a degree would have led them to think of teaching as a career.

By forming part of a general inquiry it is hoped that the market research aspect of the study would not have been too obvious.

Of the 163 young people interviewed, 51 were still living at home and many of the rest were in higher education, anywhere from the north of Scotland to the south of England, but there were clusters in and around Manchester, Leeds, Huddersfield and Newcastle-upon-Tyne.

The interviews were conducted by 14 freelance interviewers plus four members of the research team. Interviewees were allocated on the basis of geographical location with the number per interviewer ranging from four to 19. The interviewers were all experienced and had worked in market research and/or university research projects.

A briefing meeting was held on 16 February, 1987, during which the purpose of the project was outlined, the preferred mode of conducting the interviews described, and materials and equipment provided. Each interview was taped and the quality of each interviewer's work monitored.

Three weeks later on 9 March, 1987, a further meeting was held to collect the completed schedules, tapes and transcripts, and to hear about the interviewers' experiences. During the three-week period, 142 interviews were conducted and two questionnaires returned from abroad.

A further 21 interviews were conducted in the period 10-27 March. The remaining twelve questionnaires were received over an extended period - the last being received in the third week of April.

III. ATTITUDES TO TEACHING

The 177 returns provide a good indication of current attitudes to teaching and the likely reception for the proposed new degree.

Table 3.1: Where the School Leavers Went¹

Destination	Mixed		Science-Maths		Other Subjects		Total	
	M	F	M	F	M	F	M	F
Higher Education	59.5	57.1	64.3	70.8	62.1	62.5	61.7	62.7
Employment	18.9	25.7	7.1	16.7	10.3	16.7	12.8	20.5
Re-take A-levels or Equivalent	8.1	17.2	17.9	4.2	17.2	8.3	13.8	10.8
Unemployed	0.0	0.0	0.0	0.0	6.9	0.0	2.1	0.0
Voluntary Work	0.0	0.0	0.0	0.0	3.5	0.0	1.1	0.0
Other	13.5	0.0	10.7	8.3	0.0	12.5	8.5	6.0

1. Percentages within columns.

Table 3.1 shows that just over 60 per cent of the sample went on to higher education. There were relatively few differences with A-level combinations, though perhaps those in the ‘science-maths only’ group were slightly more likely to have done so. About one in eight of the young men and one in five of the young women had entered employment, with perhaps slightly more from the mixed A-levels group taking this route. A similar proportion of the young men and one in ten of the young women were re-taking A-levels or attempting something equivalent. Very few of our sample were unemployed or were doing other things.

Table 3.2: A-Level Performance

Sex	A-Level Subject Combination ¹			Total
	Mixed	Science Maths	Other Subjects	
Male	8.9	12.4	7.1	9.4
Female	6.6	9.7	10.8	8.7
Total	7.8	11.252	8.8	9.1

1. Differences between subject groups, $F = 5.06$, $df_1 = 2$, $df_2 = 171$, $p < 0.01$; Interaction of sex and subject group, $F = 5.16$, $df_1 = 2$, $df_2 = 171$, $p < 0.01$.

There was wide variation in A-level performance when this was scaled by assigning 5 for an ‘A’ through to 1 for an ‘E’ and zero for not achieving a grade. Table 3.2 shows that generally the young men in ‘science-maths’ and young women in the ‘other subjects’ (arts and social sciences) had the better performances.

Overall, those in the science-maths category did best and this was true whatever index of A-level performance was taken - total A-level score, average A-level grade, number of A-levels passed or the percentage passed. Young women in the ‘other subjects’ group (arts and social sciences) tended to do better than those taking mixed A-levels, but this was reversed for the young men, again whichever index was taken.

Table 3.3: A-Level Scores by Destination

Destination	Mixed		Science-Maths		Other Subjects		Total	
	M	F	M	F	M	F	M	F
Higher Education	9.8	9.1	13.6	12.9	9.4	13.2	10.8	11.5
Employment	4.7	2.9	10.0 ¹	3.0	3.7	6.3	4.9	3.5
Re-take A-levels or Equivalent	5.7	4.0	4.4	-	2.2	2.0	3.8	3.1
Unemployed	-	-	-	-	2.5	-	2.5	-
Voluntary Work	-	-	-	-	11.0	-	11.0	-
Other	13.0	-	16.3	3.0	-	10.7	14.3	7.0

1. Not including one student working for two years before going to university with 5 A-levels at grade A.

Table 3.3 shows A-level scores by destination after A-levels. Those going on to higher education had by far the better scores, the differences with sex and subject area generally reflecting the overall pattern. Those going directly into employment tended to have much lower scores suggesting that employment may not always have been the first choice. Not unexpectedly, those re-taking, usually had low scores, but those doing voluntary work or going overseas usually had good enough grades for university entrance, so it is likely that in most cases a break from study had been planned.

The sample as a whole could not be said to hold a favourable attitude towards teaching as a possible career. Table 3.4 gives the responses to the question “to what extent does teaching as a career appeal to you?” About 62 per cent of the young men, and nine per cent fewer young women, disliked the idea ‘strongly’ or ‘a little’. Only about twelve per cent of the young women and one per cent of the young men were strongly attracted and just over 20 per cent in each case liked the idea a little. Treating the responses as points on a rating scale (5 for ‘like very much’ to 1 ‘dislike strongly’) showed a significant difference between the sexes ($F = 5.18$, $df_1 = 1$, $df_2 = 171$, $p < 0.05$) but not between the subject groups.

Table 3.4: Appeal of Teaching as a Career¹

Teaching as Career	Mixed		Science-Maths		Other Subjects		Total	
	M	F	M	F	M	F	M	F
Like very much	0.0	17.1	0.0	8.3	3.4	8.3	1.1	12.1
Like a little	24.3	17.1	21.4	25.0	17.3	33.3	21.3	24.1
Not bothered either way	16.2	11.5	21.4	16.7	10.3	4.2	16.0	10.8
Dislike a little	27.0	37.2	25.0	29.2	27.6	16.7	26.6	28.9
Dislike strongly	32.5	17.1	32.2	20.8	41.4	37.5	35.0	24.1

1. Percentages within columns.

When the young people were asked to say what they thought the attractions of teaching as a career might be, 21 per cent (25 young men and 12 young women) could not think of one. Table 3.5 shows the main perceived attractions.

Table 3.5: Putative Reasons for Becoming Teachers

Main Attractions	Number	Percentage
Help People/See Them Learn	91	43.5
Imparting Knowledge/Teach Favourite Subject	47	22.5
Good Holidays/Hours	28	13.4
Total¹	209	100.0

1.140 respondents offered a total 209 possible reasons (adding together each respondents list) why a person might want to become a teacher.

As expressed by the few people (one young man and eight young women) who **very much liked the idea of becoming a teacher**, the attractions of teaching were seen as:

The working with people. It's your own personal sort of feeling you're capable of doing that sort of thing. Also the fact that at least you're doing something useful, you're using your knowledge to aid others.

It's what I've always wanted to do, right from being small, now I like children and like the idea of teaching children.

I like children; I like their company. I find them fascinating.

I don't know, it has good holidays!

Working with people - and also the ability to spread some of the knowledge that I've learnt.

You get long holidays and I'd like being with teachers and children.

The social sort of side appeals to me very much. There is a side of me that would like to do it. I have always liked children. I just like helping people.

Respondent found it much easier to answer the question what puts you off teaching? Only five (2.8%) replied “nothing”. The other 172 put forward 314 objections. Table 3.6 sets out the details.

Table 3.6: Perceptions of What Puts People Off Teaching

Obstacles	Number	Percentage
Discipline/Attitude Of Pupils	77	24.5
Poor Salary	62	19.7
Lacks Variety	41	13.1
Personality Unsuitable/Don't Like Children	40	12.7
General Conditions ¹	37	11.8
Marking/After Hours Work	20	6.4
Low Status	14	4.5
Total²	314	100.0

1. Includes government policies, promotion resources, job availability.

2. 172 respondents offered a total 314 possible reasons (adding together each respondents list) for not wanting to become a teacher.

Among the things that the 53 (33 young men and 20 young women) who **strongly disliked the idea of teaching** said were:

My mum's a teacher - she's head of the third year. I nearly thought she'd have a breakdown - the pressures, truancy, everything.

I'm not going to say 'I hate children'. I like them, but I tend to feel that if you're inside with kids all day you tend - I wouldn't say you get like them - but you'd tend not to be as mature as working with adults all the time.

I don't like kids, especially in school. I've seen what teachers have to put up with. Also the pay is supposed to be bad.

Not very many career prospects; you're sort of stunted really. Not very well paid. I'm not very good at dealing with children.

Both my parents are teachers - the strikes - I just couldn't do it (teach). If they go out on strike they might as well all go out and have done with it. They'll never get anything done - just half days here and there ... it takes so long for them to earn decent money.

Well, at the moment, the rates of pay. It's lost all its status.

From what I saw at school, teachers have a hard time of it. The way we behaved at school, I wouldn't like to be in charge of a class like us.

The money, the children. I've been a less than exemplary pupil myself, and it seems to me to be very unsatisfactory at times. The kids can be awful. For myself, I must admit, I don't work very hard. It's very awkward, wondering what to do

if someone who doesn't hand work in, or doesn't pay attention, or is sometimes just downright rude. I could put up with it, but I don't know for how long. I probably wouldn't enjoy my day.

I couldn't stand in front of a load of kids teaching, knowing what I was like and what others have been like to teachers. I don't think I could stand that. There is a lot of cheek these days. The pay is O.K. from what I can gather if there are two of you working, but from what I have heard, one wage is not brilliant for supporting a family. There is a lot of competition for promotion. There was only the one head and about a hundred teachers at my school.

The fact that at secondary school ... the getting up and keeping control of the class. Well I don't think I could do that – and that puts me off. The fact that you tried to teach in a certain lesson to a set of supposedly “thick” kids who aren't bothered about learning, and you must get so frustrated trying to get them to learn. There are always a few that aren't bothered at all, and you can see them throwing their future away practically - whereas at that time they cannot see it. I think that must be hard for teachers.

Not the money. I know how I felt towards my teachers and I wouldn't like people to feel that way towards me.

Once I thought that I'd like to teach maths when I was doing O-levels. But I think it'd be awful for me to try and control 30 students.

All those screaming kids! Well I don't really like getting up in front of people and having them constantly looking - I suppose it'll be like that in town planning. I don't know, it's just the responsibility of it I suppose, to have people relying on you for their future.

I don't think I've got the confidence to stand in front of a room full of people. And I think it would be a really boring job; I don't know why. Even when I was at school I couldn't stand to think ... you know when people said “I'd love to be a school teacher”. I'd think “Oh God, no!” I don't know what it is about the job, I just know I couldn't do it. It doesn't appeal to me at all.

I'd find it particularly tedious I think. I haven't got a lot of patience with a lot of children all at once. I mean, I'm all right with one or two, not with a lot. I don't feel I'm cut out to be a teacher. I'd find it dull I think because it's not enough of a challenge for me. Not the type of challenge I want anyway.

Classes for a start - the atmosphere in the classroom - I don't think I could put up with that five days a week in and out; the tediousness. The lack of creativity as well; you're stuck to a given syllabus. I like to get out, be creative, design things. I don't think, being a teacher I could be doing my best.

Children - just the fact that I go baby-sitting quite a lot and I really couldn't stand working with children.

I think the pay is abominable. I think the way children treat teachers is abominable. The work that they have to do is a lot for the money they get. They

have got degrees and yet they are not appreciated at all. I think the teaching profession is one of the worst at the moment.

It looks to me rather repetitious and there is certainly not a lot of money in it. I think I would get fed up with doing the same thing year after year, particularly with young children. I would rather be at the more advanced level.

The teachers I've known, the best parts of their characters were blunted by having to be a teacher. It's a very hard way to earn a living. You have to be very dedicated.

I just don't want to teach. I can earn more money in other fields.

The children, low pay. That's it.

As far as I can see it is teaching the same thing year after year. Everyone keeps telling me there are perks to the job, but I can't see them.

It's just the whole environment really. Giving the same lessons every day to the same children.

Seems to be such a great deviation from what must be the primary objective of teachers - provide education, not to be, as they appear, society's social workers. Instead, teachers should be given the opportunity to provide a traditional but broad education without government interference.

Bad pay, extremely boring, simply repeating work annually, controlled by headmaster.

It's your responsibility to get the students to pass. I think it is quite a lot of work, and weekends as well as doing more than one group, marking the books and everything. With most jobs you can just come back and forget you have got the job and enjoy yourself. So I think it is quite a lot of work. I think you have got to enjoy it as well. If you enjoy what you are teaching, then that's O.K.

The pay ... I know there is a big argument about how they get a lot of time off, but they don't get a lot of time off with lessons and things, it's hard work. The kids are terrible, especially to the student teachers. I wouldn't want to work with them (children).

The wages are very poor and I don't like children. I also don't agree with trade unions, I wouldn't like to have to join one.

The environment, the money ... having to do a lot of disciplining myself. It's no fun if you're having to spend all your time keeping discipline in a class and can't actually do any teaching.

When the young people in the sample were asked how they 'regarded teaching as a job', only three per cent of the men and 12 per cent of the women described it as '**a very good job**'. They said such things as:

It's a very good job if you're interested in what you're teaching.

A very good job if it's done properly in a competent manner. It's no good being a teacher and not being wholeheartedly involved. It is a vocation and basically you have to be vocationally minded.

It's psychologically rewarding to see pupils make progress, get to grips with a subject and pass their exams.

All my teachers at school seemed to enjoy it. That's what makes me think it's a good job ... on the other hand, it's the only job I've seen adults do. I've never been in a bank or a factory.

It's a very good job if you are cut out for it. It's a very good job.

I think it's a very worthwhile job in that respect of good – but in the sense of being a good job as in secure and a lot of money and high status - then it is not, it is a very poor job.

From a selfish point of view, because it's a job I've always wanted to do, or been wanting to do for a long time. I feel I'd be helping people.

I think it should be a very good job but not everybody sees it like that and the people who don't see it like that are the ones that have the power to pay them lower wages or whatever so it's taking a lot of the prestige away. So I think it's a very important job. It's not regarded generally as a very important job I don't think - not as important, say, as jobs in business.

A very good job, but not appreciated by the majority of people - reflected by the very poor pay.

Nineteen per cent of the young men and 17 per cent of the young women said it would be **'the last resort'**. Many of the comments were similar to those made in relation to strongly disliking the idea of becoming a teacher, but the vehemence of their dislike stands out:

My experiences of Mum and Dad scraping for money - not really being able to afford me being here. My Dad's been teaching 20-25 years. He's a headmaster now - but he's still not - never seems to have any spare money. There's enough to eat, eat reasonably well, but not really. He can never just forget about it and just enjoy himself, not even for a week when he's on holiday.

The politicised nature of today's education, with certain councils bringing about government and popular antagonism through altruistic, but misguided and fanatical personal opinions concerning racial, sexist exploitation and discrimination. Therefore, not surprisingly the reputation of the whole profession has suffered through the actions of a small minority. There is now much more government inference in education, when teachers should be left to get on with the job.

The wages are very poor, so I would rather go for a better paid job. Teachers are also treated very badly by the pupils and the government.

I can't take all the aggro that they (the teachers) take. It must be hard on them. You've got to be very organised. I think you've got to have it within yourself really - geared up to it - be able to communicate well in front of people and get over things that you feel.

I don't think I could teach children the same thing year after year. I don't like what is happening to the education system at the moment. I don't think the government's doing enough as far as education's concerned. There's a lot of training as well. You've got to be sure. You do your degree and then go to teacher training. You've got to be incredibly sure to be able to stand that. I wouldn't do it as a last resort.

The attitude to teaching in the sample was then generally less than favourable. Whether or not the person was attracted to teaching seemed to depend in large measure on how much they liked children and had the confidence to face them in groups of thirty or more day after day. But overlying this basic disposition towards or away from people appeared to be an acute concern with the rewards of teaching in terms of salary and status. In the next chapter we investigate this further using Rosenberg's (1957) measure of occupational values.

IV. OCCUPATIONAL VALUES

A possible explanation for the reluctance of science specialists to enter the teaching profession is to be found in their occupational values. Table 4.1 shows that there is general agreement that, in terms of Rosenberg's (1957) value orientations, teaching is essentially a 'people-oriented' profession - being with people and helping them.

Table 4.1: Perceived Satisfactions of Teaching¹

Reward	Mixed		Science-Maths		Other Subjects		Total	
	M	F	M	F	M	F	M	F
Intrinsic	18.9	37.1	17.9	33.3	37.9	29.2	24.5	33.7
Extrinsic	5.4	11.4	0.0	0.0	0.0	0.0	2.1	4.8
People	75.7	71.4	75.0	62.5	75.9	70.8	75.6	68.7

1. Percentages rating 'high'.

It is also seen as providing intrinsic satisfactions, but to offer little in the way of extrinsic rewards such as 'good money'. The rewards teaching can offer were seen similarly across the subject groups. Young women were more inclined to see it as being intrinsically rewarding ($F = 6.45, f_1 = 1, f_2 = 171, p < 0.01$).

When we come to look at the occupational values of the young people themselves as in Table 4.2, the young women emerge as consistently more people-oriented than the young men ($F = 15.58, df_1 = 1, df_2 = 171, p < 0.001$).

Table 4.2: Occupational Values¹

Value	Mixed		Science-Maths		Other Subjects		Total	
	M	F	M	F	M	F	M	F
Intrinsic	35.1	14.3	35.7	20.8	48.3	37.5	39.4	22.9
Extrinsic	43.2	25.7	28.6	25.0	44.8	33.3	39.4	27.7
People	18.9	54.3	10.7	54.2	41.4	50.0	23.4	53.0

1. Percentage rating themselves 'high' on those values.

Among the young men there were differences with subject group. Those in the science-maths group were significantly less people-oriented than those in 'other subjects' - the arts and social sciences ($t = 3.13, p < 0.01$) - and somewhat less so than those taking mixed A-levels ($t = 1.91, p < 0.06$).

One might predict from the correspondence of the students' occupational values to the perceived rewards of the profession that young women would be more likely to be attracted to teaching as a career than would the young men. Among the young men, those from arts and social sciences would be most likely to favour the idea, followed by those who had taken mixed A-levels, with the science specialists being the least likely. As we saw in Table 3.4 (page 8) this is, in part, borne out: the young women were significantly more likely to be thinking of a career in teaching, but among the young men, the relatively people-oriented arts and social science students were no more likely than the scientists to be thinking of becoming teachers.

When difference scores between the perceived satisfactions of teaching and the actual occupational values were calculated, they were found to be significantly lower for the young women ($F = 7.32, f_1 = 1, f_2 = 171, p < 0.01$). The order for the young men came out as predicted, with the biggest difference for the maths-science group, the smallest for the arts and social science group, and the mixed group in-between. But when it came to extrinsic rewards, the biggest discrepancy lay with the young men in the mixed group.

Together with the earlier findings, this suggests that many of those looking for people-oriented satisfactions are being put off by what they see as the poor material rewards of teaching. This is supported by a multiple regression analysis in which the occupational values were used to predict the appeal of teaching. The most predictive, as Table 4.3 shows, the extrinsic rewards of 'good money' and 'social status', with 'work with people' third with borderline significance.

Table 4.3: Regression Analysis

Value	F	Significance.	Multiple R
Good money	6.44	.012	.189
Social Status	5.21	.024	.253
People	3.74	.055	.290

Although teaching is recognised to be a 'people-oriented' profession, it appears that, at the present time, unfavourable impressions of the status and the salary attached to it are of more importance.

In the factor analysis of the occupational values of our sample, shown in Table 4.4, ‘**people-oriented satisfactions versus good money**’ emerges as the first factor and it was the only one to correlate significantly with the appeal of teaching ($r = +0.16$, $p < 0.05$). The young women were found to score significantly higher on this factor than the young men ($F = 17.16$, $f_1 = 1$, $f_2 = 171$, $p < 0.001$).

Table 4.4: Varimax Rotated Factor Matrix¹.

Occupational Value	I	II	III	IV
Adventure	040	084	-703	-014
Good Money	-626	-134	195	263
Special Abilities	280	590	227	052
Work with People	553	-099	-126	337
Security	-017	007	828	020
Leadership	-009	236	065	738
Status	040	-118	-009	747
Help Others	800	031	140	058
Creative	069	787	-179	019
Free of Supervision	-366	616	-114	-001

1. Decimal points omitted; significant associations shown in rectangles.

On Factor IV, which is also a people dimension, but more from the point of view of **leadership and status**, it was those in the mixed A-level category who scored highest ($F = 3.15$, $f_1 = 2$, $f_2 = 171$, $p < 0.05$). This is consistent with the view that many in the mixed category could become science teachers, but prefer to employ their numerical skills and people-oriented outlook in more financially rewarding occupations. Indeed, this is one of the reasons put forward by Smithers and Robinson (1986b) for them broadening out from the sciences.

The factor structure of Table 4.4 is clear-cut and gives us confidence in Rosenberg’s orientations. Factor II is loaded predominately by ‘**intrinsic rewards**’ and Factor III is readily identifiable as a measure of ‘**security**’.

Predicting on the basis of people-orientation, young women, and young men in the mixed category, would be more likely to be attracted to teaching than those in maths and science *per se*. But, at the present time, in circumstances coloured by the long-

lasting teachers' dispute, many potential recruits are put off by what they see as the poor rewards. As well as broadening the recruitment base to include those taking mixed A-level combinations, our study of occupational values suggest attention should be given to increasing the extrinsic rewards of teaching.

V. INTEREST IN BROADER DEGREE

As a preamble to direct questions about the proposed Science Education degree, the sample was asked whether a broader degree combining science/maths with other subjects would have been attractive to them. Table 5.1 shows that, overall, about a third of the sample expressed interest and even about a fifth of those who had taken no science at A-level said it would have some appeal. But standing out is that over half the young women in the science-maths category said that such a degree would have been attractive.

The level of interest is perhaps higher than might have been supposed and suggests that quite a few of those taking science-based degrees, particularly young women, are finding such degrees too narrow. Another implication is that not a small number of those who had taken no science A-levels would have liked to have studied some science if given the chance.

Table 5.1: Interest in Broader Degree

Interested?	Mixed		Science-Maths		Other Subjects		Total	
	M	F	M	F	M	F	M	F
Yes	37.8	31.4	35.7	54.2	20.7	25.0	31.9	36.1
Maybe	10.8	11.4	21.4	8.3	3.4	12.5	11.7	10.9
No	51.4	54.3	42.9	37.5	75.9	58.3	56.4	50.6

A broader pattern of sixth form studies with more combined degrees in higher education would increase the pool from which science teachers could be drawn, and might add appreciably to those with the necessary personal qualities to enjoy teaching - for example, personal orientation.

Table 5.2: Interest in Science-Maths and Education Degree

Interest	Mixed		Science-Maths		Other Subjects		Total	
	M	F	M	F	M	F	M	F
Yes	13.5	14.3	10.7	25.0	3.4	8.3	9.6	15.7
Maybe	8.1	8.6	3.6	8.3	0.0	0.0	4.2	6.0
No	78.4	74.3	85.7	66.7	96.6	79.2	86.2	73.5

Table 5.2 shows the responses to the question about the appeal of the proposed science education degree leading to a teaching qualification. In line with earlier findings, the young women showed somewhat more interest. It was those young women in the science-maths category who gave the highest proportion (25%) of ‘yes’ responses. This is supported by Table 5.3 which shows that one in eight per cent of the young women in the science-maths category said that such a degree would have led them to think of teaching as a career.

Table 5.3: Influence of Science-Maths and Education Degree on Career Choice

To Teaching	Mixed		Science-Maths		Other Subjects		Total	
	M	F	M	F	M	F	M	F
Yes	2.7	2.9	0.0	12.5	3.4	0.0	2.1	4.8
Maybe	13.5	0.0	14.3	20.8	3.4	4.2	10.6	7.2
No	83.8	91.4	85.7	66.7	89.8	83.3	86.2	81.9

Behind those numbers is a wide range of personal stories. Here we have room for only five, which have been chosen to be representative.

Pen Portrait 5.1: Ann

Ann is a science student currently taking a B.Sc. (Hons.) degree in chemistry at a polytechnic. She had hoped to be able to study pharmacology at university, but her A-level grades of C in biology, E in physics, E in chemistry and an O-level pass for mathematics were not good enough. Ann therefore took what she saw as the best available alternative.

Although quite committed to the idea of biomedical research, she has considered a number of alternative careers - among these is teaching. Ann rates teaching as “a moderately good job” and explains: “It’s not excellent because they (teachers) don’t seem to have the authority they once had, especially in the classroom situation, but they still have a certain amount of respect”. The positive aspects of a teaching career she sees as “the variety and my own personal experience of teachers I’ve had ... the way that they wanted to impart knowledge. They liked it, so I would want to do the same”. But she feels “the present decline in the academic system” would put her off teaching to some extent.

Ann expressed interest in studying a broader degree at university: “it would enable you to branch out more and look at a wider spectrum of jobs”. She is also interested in the proposed science education degree course: “It would produce a greater number of science, physics and maths teachers, because industry at the moment seems to be taking from that background. It also allows people with lower qualifications to get into teaching”. Ann considers that the existence of a Science Education degree course may have led her to consider teaching chemistry as a career.

Pen Portrait 5.2: Barbara

Barbara is a full-time personal assistant in an insurance company and is considering taking some professional exams in the near future. In 1986 she sat A-levels in physics, chemistry, maths and general studies, but she was disappointed with her results (Grades E, O, O and D respectively). “At the time I didn’t know what I was going to do, I was better on the science side - I was fairly broad ranged, but I was more interested in the science side. I was disappointed in my results, I was expected to do better. For example, I achieved an A in maths at O-level”.

Barbara began to consider employment rather than higher education before the end of her sixth-form studies, “throughout the two years I was looking to work rather than university. And part the way through I knew I was not doing as well as I should have been doing.” She did, however, give consideration to a teaching career, though the prospect of taking a degree was off-putting. “I didn’t believe I would have the patience to teach primary children, therefore I looked to secondary level, but I didn’t know what I wanted to teach. Maths was my favourite subject, but that would have meant taking a degree in it.”

For Barbara, teaching is a good job and one that she would enjoy very much. She believes the work conditions are quite satisfactory. “The hours aren’t bad, although I do appreciate that work has to be done after school, but it can’t be any more than a 9 to 5 job. I guess you get an awful lot of satisfaction from teaching.”

After receiving her A-level results, Barbara gave no further consideration to teaching or higher education and looked for employment. Perhaps because of disappointment with her A-level results, Barbara is unsure about the prospect of studying science at degree level, but expresses definite interest in the idea of broader degrees and particularly the proposed science education degree. She feels it could have been just what she was looking for since she lacked confidence in her ability to tackle science to a high level, but nevertheless wanted to teach Maths. She comments: “I think it would interest a lot of people, because to do a pure maths or physics degree is daunting to some people, whereas a combined science degree would be more appealing to the less confident”.

Pen Portrait 5.3: Charles

Charles is currently reading mathematics at university but is undecided about the career he will ultimately pursue. He has a very strong background in Maths and Science having achieved grade A in his Maths, Further Maths and Biology A-levels, and a B grade in Chemistry. Charles enjoyed studying these subjects, but feels he may have restricted his choice of degree courses by not taking Physics. His decision to study Maths at university was arrived at through a process of elimination rather than by any particular ambition to be a mathematician.

“I visited a dentist school ... and decided against that; was put off medicine since it takes so long to get qualified - and because I had no really strong urge to do that and had been advised against it. I visited a veterinary surgeon for a

couple of days and was put off that. Biochemistry I decided would close down career options, especially since I did not know what career I wanted. It would have been difficult to do Engineering, not having done Physics A-level. So Maths, which I had not thought of till I had looked at all of these, seemed to keep my options open and is a good degree. And I am interested and good at it”.

Teaching is a career Charles has considered in the past and he is attracted to the idea to some extent. “Helping to get kids interested and competent in the subject, and passing on knowledge in a way which is easy to understand would provide great job satisfaction”. However, he feels the low pay might be off-putting and is concerned that he could find out he is totally unsuited to teach. Charles clarifies his views on teaching: “It would be a good job if I found I was able to teach well and enjoy teaching and get along with the children, otherwise it would end up being a poor job. Satisfaction with the work is of utmost importance.”

Charles is interested in the idea of broader university degrees since it would allow him to continue working in other areas of science that he enjoys. He is aware that this may increase the total work-load whilst giving less detail in each subject, but nevertheless feels that employers may find such degrees attractive. “A combined degree would show you have the ability in more than one field and also show you are able to handle a tougher work-load, which should be attractive to potential employers”.

For Charles, the proposed Science Education degree is perhaps too vocational since he is still undecided about a career. “This course would seem to be specialising in teaching too soon for me. Also I know a teacher who did this sort of course and he told me that he is not considered as a scientist but a teacher - he is still interested in research, so it has cut down his options”. However, Charles did not fully dismiss the possibility that the availability of the Science Education degree could have led him to consider a teaching career in science or maths.

Pen Portrait 5.4: Dan

Dan is enrolled at a polytechnic to study for a Higher National Diploma in Electrical and Electronic Engineering. He was very disappointed that his A-level grades did not enable him to gain entry to a university degree course in Electronic Engineering, but hopes to do so after completing his HND. Dan took A-levels in maths, physics, economics and general studies and obtained grade E for all but Maths - for which he obtained only an O-level pass. Dan feels that sixth-form students are often unaware of how difficult A-level work will be. “It’s a great jump between O-levels and A-levels. There is a big gap. I did quite well in my O-levels, but I didn’t seem to cope well with my A-levels ... I think in the sixth-form it should be impressed upon that person the big jump from O-level to A-level. I don’t think that’s stated enough”.

Dan is committed to the idea of gaining a degree in electronic engineering - perhaps even to do some post-graduate work – and to pursue a career in this general field. Dan is unsure of the particular job he would like and prefers to keep his options open for the time being. He is interested in the management

and administration aspect of engineering since he feels that other electronic engineering jobs tend to be very technical in nature and mostly involved with laboratory work. In this light, it is not surprising that Dan is to some extent attracted to a career in teaching: “you get a sense of sharing your knowledge - you help people”. He is, however, more attracted to the idea of lecturing at a polytechnic than teaching in a secondary school: “I’d say you can go into greater depth with the subject (at HE level). And you get better communication between students and lecturer.”

The idea of studying a broad degree at university is not particularly appealing to Dan since he feels he is more interested in practical subjects. The proposed Science Education degree “would have been a vaguely possible alternative ... if all the other doors were closed.” For Dan, the proposed degree would have provided the possibility of becoming a technology teacher had he not been accepted to study for an HND in Electronic Engineering.

Pen Portrait 5.5: Elizabeth

Elizabeth is actually on a combined Biology and Education degree which leads to Qualified Teacher Status, but is experiencing some disappointment with it.

She had ideally wanted to study medicine and chose to take A-levels in biology, physics and chemistry plus general studies, because she believed they would be the most appropriate, rather than because of any particular interest in science. Her results, however, were disappointing, C for chemistry and physics, D for biology and an A for general studies, and not good enough for a place in medicine. “If I had to choose (A-levels) again, I would do history, English language and geography. They’ve always been where my interests lay, but I’d always wanted to do medicine. In retrospect, I think I could have got into medical school with arts subjects.”

School teaching is a career holds some appeal for her. “I suppose I’ve always known that I could teach. In my first essay on ‘When I Grow Up’, I put ‘I want to be a teacher’ because it is in the family.” Prior to commencing university Elizabeth had experience of teaching children to swim and found it very enjoyable. The opportunity to continue working with children and long school holidays are a definite plus for her. She does, however, have doubts about the long term level of job satisfaction teaching can provide.

“It doesn’t really give you an opportunity to expand. Unless you can get complete satisfaction from passing on knowledge it’s a bit of a dead-end job. I can imagine how disillusioned some people get. I’ve always believed that it’s very good as a second job in a marriage. With both people teaching, it’s a great job because of the long holidays. It’s something particularly that a woman shouldn’t disregard.”

“I had thought that a degree in Biology with QTS would mean that at the end of it I could get into Pharmacy or a lab. But I don’t honestly think that anybody would take any notice of this degree other than for being a teacher”.

She has become increasingly dissatisfied with the combined degree she is taking and correspondingly less sure about her commitment. She is already considering a number of alternatives.

“I think it’s the non-continuity. It is so mixed-up ... doing four things at the same time is very hard at this level - not in terms of hard work. The work is, in fact, very easy, much easier than A-level, the hard thing is keeping abreast of it all. Because each subject needs a lot of reading, it produces a lot (of work) which to be perfectly honest is irrelevant. I came to university having thought I’d already lowered my standards (from Medicine to Teaching). It hasn’t got the academic content that I wanted. From what I’ve heard it gets worse.”

“Teaching’s fine, but I don’t think I can be satisfied with it for the rest of my life. I enjoy it, but I don’t think it’s something that can satisfy me. I will aim first to get the best possible degree that I can, do my probationary year, but then whether I will carry on teaching or not I don’t honestly know. I’ve thought of accountancy ... I have even thought about staying on (at school) or going into law school. Even about going into medicine, but having said I was so set on medicine there are a lot of ethical things that I don’t think I could cope with.”

Perhaps because of her own experience, Elizabeth expresses reservations about studying broader degrees at university. “I don’t know where it would lead to because surely then every job would have a longer apprenticeship. You need to have a specific grounding.”

In view of her dissatisfaction with her own combined degree course, it is perhaps surprising that Elizabeth expresses some interest in the proposed Science Education degree. She does feel the degree would have led her to consider teaching physics - the subject she was most pleased with at A-level rather than biology, where she was disappointed in her result. “I did have problems with the physics course at school because I didn’t do A-level maths, but I had to work harder and I got much more enjoyment. In the end physics was probably my best subject.”

Elizabeth’s disappointment with having chosen subjects she felt she needed rather than wanted have caused her to think seriously about the problems of A-levels and career choice. She has some firm opinions and advice to offer: “I honestly think that people should go into the sixth-form wanting to do their best subjects. I think fifth year is too early to start thinking seriously of one career, which is what I did.”

“Stick with your best. I think in the end that is the only way to get in the career you really want, and I think it’s a shame more schools don’t tell you that”.

Our five pen portraits, in addition to breathing life into the numbers, bring out quite nicely the main reactions to the proposed Science Education degree. Barbara pinpoints what perhaps would be the major advantage when she suggests there are people who would like to teach maths and physics, but who for some reason do not wish to take

pure degrees in those subjects. Ann also notes that such a degree might enable people to go to university who would not otherwise be able to do so.

But it has to be recognised that the degree for some would be, as Dan indicates, a fall-back. And, as Charles says, it would mean people committing themselves to teaching at the beginning of a course, which for some might be too soon.

Elizabeth's case illustrates the issues that can arise in combined science/mathematics and education degrees. But if it were to be organised properly to degree standard and avoid the pitfalls that Elizabeth is experiencing, it could make a valuable contribution to teacher supply. About one in eight of our sample - which includes those who had taken no science at A-level - would have considered such a degree had it been available.

VI. VIABILITY OF SCIENCE EDUCATION DEGREE

Our findings indicate a small but not negligible demand for the proposed Science Education degree, with about a quarter of the young women in the science-maths category saying they would be interested. Some of those attracted to teaching by this route would, like Barbara, have been drawn in from other areas of work, but it is likely also that some students training to be teachers in the public sector would have been tempted by the prospect of studying at university.

Against a background of concern with the salary and status of teaching, probably engendered by the lengthy teachers' dispute, the results point to what may be a fundamental difficulty in recruiting maths and physical science teachers: the fulfilment possible in teaching may be very different from those which people who specialise in these subjects are seeking. Teaching is recognised to be primarily a people-oriented profession, but many people attracted to the abstractions of maths and physical science express low levels of interest in working with people or being involved in a helping profession. This is borne out by the responses to a question about 'what puts you off teaching'. The major difficulty envisaged was discipline and the attitude of pupils, and another commonly given reason was 'unsuitable' personality/do not like children'.

It is not known whether 'person-orientation' is a relatively enduring trait, but if for the moment we assume that it is a basic aspect of personality, then the findings suggest that to increase the numbers of science teachers we will have to widen the range of people studying the sciences at school and university. This would be an argument in favour of a broader sixth-form curriculum and more combined degrees in higher education.

About a third of the sample expressed interest in a degree combining the sciences and other subjects, including about a fifth of those who had taken no science at A-level. The results show that those taking the humanities are generally more people-oriented than the science specialists so that combined degrees might be a way of increasing the

size of the pool of those with adequate scientific knowledge to teach and who wished to do so.

Promising also, is the possibility of increasing the proportion of women studying science. Women are generally more people-oriented than men, and are more attracted to teaching. If the numbers studying maths and the physical sciences in the sixth form and at university could be increased, perhaps through the introduction of a broader curriculum, then the pool of potential teachers would be enlarged. The most interest in the Science Education degree was expressed by the young women from a science-maths background and 13 per cent said it would have led them to think of teaching as a career.

However, the proposed new degree will only be as attractive as the image of teaching allows it to be. Considerable concern was expressed about the heavy demands of teaching and the relatively poor rewards. Time and again the people we interviewed said they had considered teaching, but had rejected it because they thought they could earn more money and have a better life elsewhere. Those with one or both parents who were teachers were particularly vehement. In several cases, where the sixth-former was seriously considering becoming a teacher, his or her own teachers had said 'Don't!'

The difficulty in recruiting sufficient maths and physics teachers may be, in part, a personality problem. But there is also the very poor impression that many young people have of teaching. In both the present study and that of Finch (1986), the low salaries and poor status of teaching emerge as major barriers to entering the profession. How to make teaching more attractive, should be a priority for government and local education authorities.

If the image of teaching could be improved, it is likely that the proposed Science Education degree would be a useful new route into the profession. The findings suggest that, of those who had studied some science at A-level, 12.3 per cent of the young men and 18.6 per cent of the young women would have been interested in taking it. This perhaps as a proportion is not very high and it raises questions about its

viability, but on a national scale it would represent an eighth of 107,559 male students taking some science or maths at A-level and a fifth of 67,097 female students (DES Statistics, 1985) - some 25,000 potential applicants. And that is not to count those who might study the sciences given appropriate opportunities.

The findings point to a disjunction between the person-oriented nature of teaching and the satisfactions sought by those who specialise in the sciences. To increase the supply of teachers, more people with a knowledge of science who would enjoy working with and helping children must be found. A broader sixth-form curriculum would provide a route for many of those who presently write themselves off from the sciences after O-levels. Women are, on average, more person-oriented than men, and those taking mixed A-levels more so than science specialists. It is from among such groups that an increased supply of science teachers will have to come.

But, in the current climate, person orientation seems to be over-shadowed by the very poor image of teaching. As the factor analysis showed, the people who are prepared to consider teaching as a career at the present time are those wishing to work with people and without minding supervision or relatively low pay - and there are not many mathematicians and physicists among them.

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