Women in Engineering Retention on Courses

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ABSTRACT

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WOMEN IN ENGINEERING: RETENTION ON COURSES

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Changing trends and new technology within the various engineering fields have revolutionised work force requirements to the extent that physical strength is no longer a necessity in the workshop. Consequently, this hitherto male dominated area should have created opportunities for both sexes, yet social and psychological barriers still exist which effectively exclude women from taking up engineering as a career. There is a heavy imbalance between men and women in all aspects of engineering, yet future predictions indicate that a shortage of engineers in the UK and Europe is imminent.

A wealth of research material dealing with the reasons why women may not want to enter engineering exists. However, the reasons why the large majority of young women who ***do*** take up apprenticeships in engineering fail to complete their courses, have not been established. This research project discusses the arguments used for excluding women in the past and argues that there is now no reason why women should not have the same opportunities in traditionally male-dominated areas. Chapter 1 discusses the barriers that prevent or discourage women and young female school leavers from considering or taking up a career in engineering. Recruitment organisations and their initiatives in Britain and the EU are reviewed in Chapter 2 which ends with a summary of problems associated with these initiatives. Chapter 3 discusses the methodologies that are used in conducting research and reviews the advantages of using quantitative and qualitative methods. A rationale is given for the methodology used in this research. A hypothetical model showing the influences affecting students' retention and success is presented. Evidence gathered from responses to postal questionnaires sent to a number of randomly selected UK colleges is analysed in Chapter 4. A number of girls are identified for interview from the responses received and information gained from these semi-structured interviews is used to validate the interpretation of the data. Chapter 5 details a series of case studies of girls at different stages on engineering and motor vehicle courses and at different levels of course, from craft to BTEC National. Chapters 6 and 7 offer conclusions and recommendations.

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Chapter 1

Chapter 1

INTRODUCTION

The 20th century has brought about many technological and social changes. The technological changes are readily apparent in everyday life, from the simplest writing implement to a complex word processing machine, or from the simplest mode of transport to space travel, and so on. These technological changes have gradually become incorporated into our everyday existence and so have become easily accepted.

Engineering has supplied, not only the power, but the means of controlling it automatically. An early development was Watt's centrifugal governor used to control the speed of his steam engine. In the 1920s, the first reliable and fast acting servo mechanisms became available. The industrial application of automatic controls has been rapid in the latter part of the 20th century. The operation of oil refineries and many chemical plants is virtually automatic and sections of many firms operate automatically. A parallel development starting in the 1950s has been the automation of much of the routine clerical work which is now carried out by computers. These changes have enabled output per employee to be increased to meet the world's explosive demand for goods and services whilst allowing the working week to fall from 60 hours in the 19th century to 40 hours or less today. Transport developments in the last 150 years have shrunk the size of the world and have brought international and intercontinental travel within the means of average wage earners. Television, enables events throughout the world to be seen as they occur and telephone subscribers can now dial direct to many parts of the world.

Although there are few who would wish to return to the hard insanitary disease-ridden conditions of the early 19th century, not all advancement is on the credit side. There is industrial pollution, noise, increased pace of living, etc, which accompany any industrial advancement. On the upside of this, however, with all these technological advancements, a person's physical characteristics should no longer be a consideration in the selection of personnel for any employment.

Muscular effort and drudgery have been taken out of manual labour, both in factories and in the home. An average person can sustain a muscular effort equivalent to 35 Watts during the length of the working day. Today, the operator of a relatively small machine tool has under their control the muscular effort of several dozen men, while the driver of a car can command an effort equal to that of a thousand men. As well as supplying adequate power, engineering technology ensures that power is supplied in an appropriate form. For instance, the equivalent of the muscular effort of a million people enables the pilot of an airliner to convey hundreds of passengers for thousands of miles at 500 mph.

Because of their lack of physical strength, for many years young women were not able to consider the full range of career choices in occupations such as engineering which have been available as options to their male peers. Arguments for excluding women in the past may once have been valid, but over

the years the case has been eroded to the point where there is now no reason why women should not have the same opportunities in traditionally male-dominated areas.

A relatively high level of physical strength without doubt has, in the past, been a vital requirement for anyone wishing to undertake engineering at workshop level. This fact alone has constituted an unanswerable case for eliminating women from any consideration, as nature dictates that they are biologically physically weaker than men. Birke (1992, p 93) questions this fact when she says: " ... the physical differences between men and women can be reduced when both males and females are trained" (see Figure 1).

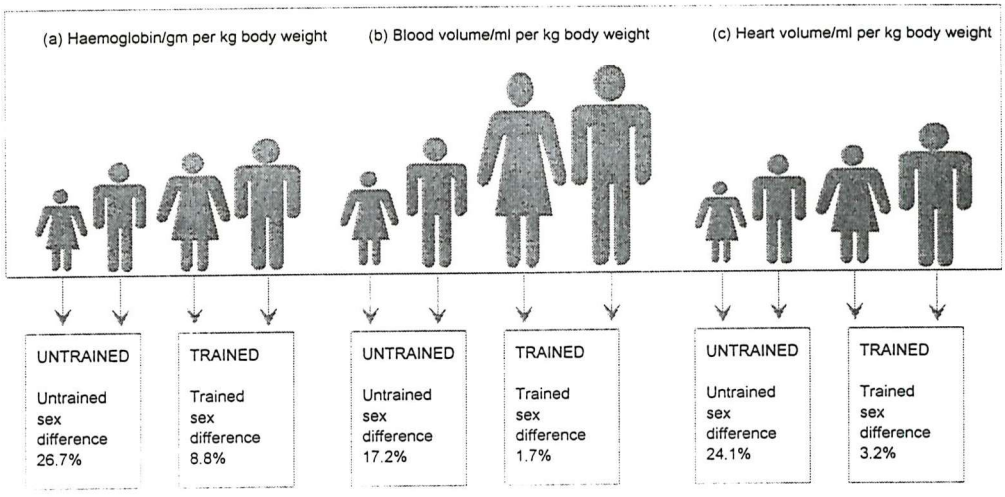

Figure 1
The effect of athletic training on some physiological features:
(a) the amount of haemoglobin in blood, (b) the volume of blood and (c) the volume pumped by the heart.
The height of each of the figures represents the value of each factor relative to untrained men.
So, the blood volume of trained women is greater than that of untrained men and roughly equal to that of trained men.

Giddens (1993, p 162) also raises the question concerning physical strength when he says physical differences in strength reach a maximum at puberty. Adult men on average possess 10% more muscle than women and a higher proportion of the muscle fibre associated with physical endurance. This difference can be affected by training and exercise. The biological differences that seem to predispose men towards active physically demanding work as compared to women are actually slight. Mechanical efficiency (how much force the body can produce per minute for a given unit of fuel consumption), is the same for men and women.

Many modern technological advancements mean that the strength barrier has been removed from a considerable number of manual jobs and it is no longer necessary to possess a high level of physical strength. An example of this non-muscular process is given by Coote (1992, p 58) who gives the following example concerning a young lorry driver called Lesley Smith. Lesley Smith decided to become a heavy goods vehicle driver. Her physical description was described by Coote as fitting someone who would be more at home selling Avon Cosmetics. On obtaining her licence, she eventually obtained a job with a local firm driving a 32 tonne heavy goods vehicle travelling long distances. These modern vehicles are fitted with power-assisted steering, brakes, etc. On one occasion, however, she was asked to drive an older type of vehicle which was not fitted with any

power-assisted systems. Her experience on driving this type of vehicle brought her to the conclusion that drivers of these older vehicles needed large amounts of stamina and muscles to manoeuvre them around tight corners and small tracks, whereas with a modern vehicle, a young child could get into a truck and steer it with one hand.

As for taking up a career as a motor vehicle mechanic, O'Donnell (1992, p 117) makes the comment that "the majority of people consider the job of car mechanics as only suitable for men". He goes on to say that "several other occupations are also seen in terms of traditional gender stereotyping by a significant minority, these include construction and engineering.

This view may have been true some years ago but now the motor trade has, over the past several years, encompassed occupations where brute force and ignorance are not prerequisites. This has come about by smaller, lighter components such as engines and gearboxes which are being used to make the vehicle more energy efficient. As for the dirt and smell, there are more and more garage workshops that are tiled with white tiles and where the mechanics wear white overalls. It can be argued that not all garages have these high standards, but if a garage wishes to remain in business and attract customers with modern vehicles, then their standards will have to improve, otherwise, like the dodo, they will become extinct.

There is also a powerful commercial argument as to why women should be encouraged into engineering at all levels. The reducing number of 16 to 18 year old school leavers will result in a future shortage of a skilled workers in all fields of employment including engineering. The changing demography and the speed at which education and training systems, together with the labour market, can adjust to these changes can have an effect on participation rates. In the UK and other European countries the 16-18 year old population peaked in the early 1980s and since then has shown a steady decline which is projected to continue towards the end of the century when the main trough is predicted to occur (Table 1).

In Germany, the change is most marked with 1992 showing a drop of nearly 30% below the 1970 level. In Denmark there is no indication of a recovery until early in the next century, while in Spain in the 1990s numbers decline as do those in other western countries in the 1980s. In Australia, Japan and the USA the patterns are quite different. The peak level is forecast to occur later in Japan, but occurred earlier in the USA. The Australian distribution fluctuates with peak levels in both 1980 and 1988.

What is more, the majority of school leavers taking up training are currently young women. Table 2 illustrates changes in participation in education and training between 1982 and 1990. Most countries increased participation over the eight years. Female 16-18 participation rates generally increased more over the period than those for males with the only exceptions being Spain and Sweden. Unless male-dominated industries such as the engineering industry take steps to open their doors and make themselves more attractive to young women, there is no doubt that they will suffer from a severe shortage of skilled workers in future years.

YEAR	Aus	Bel	Can	Den	Fra	Ger	Ita	Jap	Net	Spa	Swe	UK	USA
1966	101	99	96	108	105	100	111	126	107	98	109	116	92
1968	100	98	97	101	103	103	106	109	100	96	104	104	97
1970	100	100	100	100	100	100	100	100	100	100	100	100	100
1972	101	102	106	100	99	100	103	93	100	104	98	100	104
1974	105	103	109	99	100	103	105	89	102	111	98	101	107
1976	110	105	112	98	100	109	108	89	104	118	97	104	107
1978	115	106	114	98	100	120	112	89	110	120	95	107	106
1980	116	107	114	104	100	125	117	91	112	120	99	110	102
1981	113	106	113	107	101	127	118	95	112	125	105	112	99
1982	110	106	109	111	102	128	122	92	112	127	109	112	94
1983	108	104	103	113	101	127	124	95	110	128	112	112	90
1984	108	100	96	113	99	125	126	96	108	128	111	111	89
1985	110	97	92	110	100	122	125	104	107	127	108	110	91
1986	113	95	91	101	100	116	123	105	109	127	104	109	92
1987	117	94	91	97	100	108	122	108	109	126	100	108	94
1988	119	94	91	97	102	100	121	110	107	126	101	107	92
1990	114	90	85	99	103	83	119	114	96	126	102	103	83
1992	105	83	84	96	94	72	113	113	84	126	99	98	78
1994	100	80	84	89	86	70	103	104	78	124	91	94	79
1996	99	82	85	82	87	69	92	96	77	117	87	94	83
1998	101	83	86	76	91	72	84	90	78	107	88	98	86
2000	103	81	86	71	90	73	81	85	76	97	86	98	88
2002	102	78	86	71	87	71	78	83	76	89	NA	98	87
2004	101	78	86	74	88	63	75	79	80	83	NA	99	88
2006	NA	80	88	78	87	79	74	NA	81	79	NA	101	NA

Table 1
16-18 year old population indices, 1966 - 2006
Source: Statistical Bulletin Issue No 19/93, August 1993

Percentage of Age Groups													
	Persons				Males					Females			
	1982	1986	1990		1982	1986	1990	%		1982	1986	1990	%
Australia	59	66	69[1]		65	69	71[1]	9		53	63	66[1]	20
Belgium	72[2]	81	87[1]		72[2]	77	85[1]	15		74[2]	85	88[1]	16
Canada	67	75[5]	78[5]		NA	75[5]	78[5]	4		NA	74[5]	79[5]	7
Denmark	72[2]	77	79		NA	76	78	3		NA	77	80	4
France	66	74	82		65	71	81	20		68	76	84	19
Germany	84	90[3]	89		87	82[3]	90	3		82	88[3]	87	6
Italy	65	NA	NA		77	NA	NA	0		53	NA	NA	
Japan[6]	69	80	79		NA	NA	76	0		NA	NA	82	
Netherlands[7]	79[2]	86	87		83[2]	89	90	8		75[2]	83	84	11
Spain[8]	47[2]	52	61		46[2]	52	65	30		48[2]	53	58	17
Sweden	73	78[3]	73		72	77[3]	73	2		74	78[3]	74	
United Kingdom[9]	65	64	71		67	64	72	7		64	63	71	10
USA[10]	79	80	82		80	81	83	4		78	80	81	4

KEY:

1 1988 for Belgium; 1989 for Australia.
2 1983 for Belgium and The Netherlands; 1981 for Denmark and Spain.
3 1987 for Germany; 1988 for Japan; 1985 for Sweden.
5 Excludes certain part time students, 10% at 16-18 in 1986; 16% in 1989.
6 Includes an estimate for special training schools and miscellaneous schools providing vocational training.
7 Includes compulsory part time education for 16 and 17 year olds.
8 Estimated for all higher education in 1981; for universities only in 1986.
9 Includes estimates for public sector evening study and for private sector further and higher education including training courses for employers.
10 Includes private sector higher education.

Table 2

Participation in education and training of 16-18 year olds by sex
Source: Statistical Bulletin Issue No 19/93, August 1993

THE AIM OF THIS RESEARCH

The aim of this research is not to look at ways of encouraging young women on to engineering courses, but is concerned with ways of retaining them.

The issue of poor retention has been highlighted before in a number of research projects. To date, no study has been undertaken to gather information for analysis and interpretation that would make it possible for appropriate recommendations to be made for providing a solution to the problem.

There are a number of obstacles which present themselves to women wishing to become engineers. However, a relatively small number nevertheless decide to opt for engineering as a career and manage to proceed as far as actually enrolling on and commencing training on college courses. By so doing they are breaking with the traditions of society and are aware that they are likely to be the only female in their class. One can assume, therefore, that these women must possess a high level of motivation if they have succeeded in overcoming the negative psychological influences of social prejudice. Despite this high level of motivation, it is a sad fact that the majority of these women fail to complete their course, usually dropping out in the early stages.

Although organisations charged with the promotion and recruitment of *graduate* engineers have enjoyed a certain amount of success in recruiting young women to undertake training in engineering, the majority of them do not complete their courses. To sustain and build upon this initial success in recruitment, it is imperative that all efforts are widened to include women at the lower levels of engineering. It is vitally important that as many women as possible complete the training process and are seen to be successful in order to provide role models for other prospective female engineers. Low success rates only serve to perpetuate society's perception of engineering being an occupation unsuitable for women.

To destroy prejudice and discrimination would be to dramatically improve college retention rates and increase the number of women actually being successful and completing their training. It is for this specific reason that this research study will concentrate on the reasons why many young women engineers do not complete their courses. Once the reasons are established appropriate recommendations will be made.

Barriers that still effectively exclude women from entering engineering would seem to be purely social and psychological rather than the issue of physical strength. The result of this is that, each year, for a number of questionable reasons, engineering as a career or training is not available as an option for over 50% of 16 year old school leavers.

CHANGE OF ATTITUDES

Whilst some of the social changes that have occurred this century are readily apparent, others are less obvious. People suffering from mental disorders are no longer put in prison and forgotten. They are more likely, provided they are not criminally insane, to be sent to hospital or a home where they can be helped back into the community. With regard to other sociological changes there is not always universal consensus as to whether or not a change has actually taken place. For example, there is some disagreement as to whether or not the class structure in Britain still exists. The reason for this is that social changes are more subjective and deal with a person's own viewpoint and perception. However, the fact remains that changes are continually taking place which considerably affect the nature of the society in which we live. It is important to remember that people's behaviour may be considerably different from, and more rigid than, their expressed attitude.

There can be no doubt that major changes have occurred in the field of women's rights. Women's career expectations are now much higher than ever before and now often rival those of men. It is now also commonly accepted, legally and socially, that a woman's rights in marriage are equal to those of her husband, which was certainly not the case at the beginning of the century.

Liberal feminism has been particularly effective in the sphere of education where the right of females to compete on equal terms with males has increasingly come to be accepted, both in principle and in practice. This view is supported by O'Donnell (1992, p 174) and by acts of parliament, such as The Equal Pay Act and the Sex Discrimination Act which, as O'Donnell puts it: "These are the fruits of a widely supported effort to achieve liberal equality between the sexes."

Some key dates relating to the advancement of the rights of women are listed as follows:

1792	Mary Wollstonecraft's Vindication of the Rights of Women published.
1839	Infants' Custody Act improves mothers' rights.
1842	Mines Act makes it illegal to employ women and children underground.
1857	Marriage and Divorce Act protects separated and divorced wives.
1878	Women admitted to London University to sit for degrees.
1882	Married Women's Property Act gives wives control over their own property.
1893	In New Zealand women are given the right to vote in national elections.
1897	Suffrage agitation in Britain intensifies: National Union of Women's Suffrage Society founded.
1903	Militant campaign started by Emmeline Pankhurst who forms the Women's Social and Political Union.
1914-1918	First World War - Women are employed to take up work previously carried out by men.
1918	British women over the age of 30 are given the vote.
1919	Nancy Aster becomes the first woman MP.
1928	All adult British women were given the right to vote (an adult was defined as a person over the age of 21).
1939-1945	Second World War. Women again encouraged to take up work previously carried out by men.
1967	The Abortion Act.
1969	The Divorce Law Reform Act (actually implemented in 1971).
1975	The Sex Discrimination Act.
1975	The Equal Pay Act.
1978	The Employment Protection Consolidation Act.
1994	The Church of England Synod votes for the ordination of women priests.

It is now not unusual for many women to return to their original career or seek retraining after starting their families. This will mean that some chores and responsibilities involved in the rearing of children may be shared jointly between the woman and her male partner. It can be seen that during this century there have been some moves in the change of attitude to the role of women in society. The extent of women's participation in high profile areas such as politics may be taken as one measure of their influence on national life. The representation of women by women in the British parliament is at present extremely small, but there is, however, evidence that this state of affairs has changed. There has been an increase in the number of female candidates standing for election to parliament. The figures presented by the Times Guide to the House of Commons indicated that in 1987 there was a total of 327 women candidates who stood for election and in 1992 this figure had been increased to 568 an increase of 57%. These figures are closely supported by the Labour Research Department's

own figures which were published by The Guardian on 6th January 1992 prior to the general election. Since then there has been a noticeable change in the attitude of male MPs who entered parliament in 1992, and who have been labelled as a group 'The 92s'. This group is considered by older MPs to be a radical and questioning group who do not readily accept traditional roles and question the right of male domination within parliament. These facts make it very likely that in the very near future there will be a significant increase in the number of female MPs. In the 1997 general election, a total of 119 women MPs were voted into parliament. To conclude this point, it must be fair to assume that if women can make inroads into this most traditionally masculine of environments, they must surely be capable of similar success in other fields. It is interesting to note that in John Major's first cabinet in 1992 there were no women, which caused some consternation and forced him to bring some women into his cabinet when he reshuffled it later on that year.

CHILD CARE FACILITIES

With the increased need to encourage women into employment, either as women returners or school leavers who in time may wish to start a family and still carry on working, the provision for producing a good child care facility throughout Britain is most important if these women are to take up full time employment. O'Donnell (1992, p 69) asks the question: "How well is Britain geared for the employment of women in terms of child care?". He cites Judy Dunn who, on 5th February 1988 in the New Society, produced figures similar to the Woodhead Report 1979. Woodhead's report illustrated that in 1944, 70,000 children were able to be placed in child care while the mother worked. However, both reports show that the proportion of child care facilities available for pre-school children between 1948 to 1984 had fallen from 17% to between 2 and 3%. O'Donnell (1992, p 69) also refers to a 1990 report 'Caring for Children' which was produced by the Family Policy Study Centre in which they stated that: "There is 0.2% child care facilities in the term time for 5 to 9 year olds and 0.3% during the holidays".

O'Donnell goes on to point out that during the second half of the 1980s there had been an increase in child minders but he questioned whether or not this system is good. He goes on to put forward a reason for the lack of child care, that being " ... the ambivalence on the part of some politicians in providing suitable child care for the under-fives". Giddens and the second level course notes prepared by Woodhead (1981, p 15) for the Open University cites: "The decision to close nursery places after the Second World War was due to an explicit endorsement of the view that the mother' s place was in the home". He quotes a circular presented by the then Minister of Health in which it states: "The ministers are of the opinion that under normal peace time conditions the right policy to pursue would be positively to discourage mothers with children under two from going out to work", (Ministry of Health Circular 221/45. 1945). This view continues even today. O'Donnell (1992, p 70) quotes Margaret Thatcher's view that: "Child care should be carried out by either family, friends, neighbours or voluntary agencies". It has also been Conservative government policy to encourage the private provision of child care but the problem is that of cost for lowly paid women workers.

O'Donnell does, however, point out that not all politicians have this negative attitude to child care facilities. He cites Harriet Harman of the Labour Party, who has argued for more child care provision

and more government resources, particularly for the less well off. She also argues that ultimately central government in partnership with local government would ensure a good standard of child care. So for women to fully take advantage of full time employment one essential element, that of child care, is sadly lacking. This is again highlighted by such people as New and David (1986) who O'Donnell (1992, p 70) quotes: "Of the three main demands of women, ie control of their own fertility, equal pay for equal work, and adequate child care provision, the latter is the one that is sadly not being addressed by society". Others, such as Joanna Foster, Chairwomen of the Equal Opportunities Commission, have also highlighted the lack of child care. To quote Joanna Foster: "It is the pitiful lack of child care facilities which confines most women to part time, low paid work" (EOC Report 1990).

O'Donnell's comment (1992, p 183) sums it all up when he says: "A fundamental weakness of most women as independent wage earners lies in the fact that they also produce and are expected to bring up children".

Against the Thatcherite view of child care being provided by family, friends, etc, there would seem to have been no consideration given to the future when more and more women will find employment. When the word 'family' is used in this context, it does not refer specifically to female members of the family, but in reality it is women upon whom the burden of child care generally falls for a variety of reasons, the primary one being low pay. But as more women take up employment this will surely result in fewer family members being available.

Mason et al (1976, pp 593 & 594) concluded after examining several separate sample surveys from 1964 through to 1974, that there has been a considerable change in women's sex role attitudes since the mid-sixties. There has also been a sharp decline in the proportion of women believing that maternal employment is harmful to children's well-being. Women from all walks of life have apparently undergone comparable change since the mid to late sixties. Professor Bengt-Erik Andersson (Head of Development Psychology at the Stockholm Institute of Education) has researched the effect of placing under-fives in child care facilities and has concluded that there is no harm done to the children. In fact, Andersson feels that the earlier children mix with others, the better it is for them. He goes on to say that: "Those children who entered day care before the age of one, have performed better than others within a monitored group at the age of 13, both academically and in terms of socioemotional variables". He suggested that a major reason for this was: " ... the amount of interaction they experienced with their adults and peers at an early age".

Scanzoni (1976) suggests that: "Children may have less constraint on women's employment than once they did". US government data also supports this suggestion. They found that one of the fastest growing categories of women currently entering the labour market were those with pre-school children. In the UK this is not so due to the fact that there are so few pre-school child care facilities available, and those that are very expensive. The media, both TV and newspapers have highlighted this problem and many of the women interviewed both single and married parents, have been equally clear on the fact that it would not pay them to go out to work or attend full time courses as the cost of nursery and pre-school places are very expensive and would eat into their weekly wage. Even though the Chancellor, in his November 1993 budget, did a little to ease this problem by offering extra money

for child care provision, it did not totally satisfy the needs. In the 1997 autumn budget, the Labour government announced new policies designed to encourage pre-school care for young children so that the parents could undertake training or employment. This scheme, entitled 'New Deal' was officially launched on 1 April 1998.

Child care provision within the UK is clearly inadequate to cope with the number of women who wish to return to work after giving birth. There are, at present, very few employers who make any provision for child care. Only on one occasion did child care provision ever meet and provide adequate numbers of child care places and this was during the Second World War when the number of day nurseries increased in number from 180 in 1941 to 1,535 in 1944, which catered for 70,000 children (The Woodhead Report, 1979). This number of child care provisions, however, declined after the war. Blackstone (1971) illustrated that: "In 1969 there were only 440 day nurseries offering pre-school provision". Unless therefore the question of child care provision is radically overhauled within the UK then this will inevitably act as a barrier and prevent women from taking up full time employment or re-training. There are, however, colleges who do offer child care (although not many) as part of college facilities. One of these establishments is the Bradford and Ilkley Community College who applied for and obtained funding from the EU to provide as part of their course, child care facilities for women returners, but this facility is not given by many colleges of FE within the UK.

The launch of the government's child care strategy (New Deal) was reviewed on the 'Today' radio programme (BBC Radio 4, 19 May 1998). Child care provision for the under-3s was discussed. It was pointed out that in the UK, child care provision existed for only 2% of children under 3 years old, whereas in Denmark, the provision was 47%.

CONTROL OF THEIR BODIES

O'Donnell (1992, p 173) cites New & David (1986) who suggest that: "There are three main demands on women", one of which is fertility, which is another area of possible domination or control of women in the biological order of things. In his book, O'Donnell (1992, p 173) cites Milletts (1970) and Firestone (1972). Milletts looks at the ideological reproduction of patriarchy[1]. Firestone argues that the core of male domination of females is their control of female roles in reproduction and child bearing which has its origins in the biological inequality which makes women more dependent on men for their material necessities and protection. In Haralambos and Holborn (1995, p 640), Gilmore (1991) deals with cultural concept of masculinity and quotes from his own work where he describes man's masculinity as: "Man the impregnator - protector - provider".

Gilmore goes on further to say that: "This case is undergoing change"; which concurs with Rich (1992) who highlighted the fact that women are now taking charge of their own bodies which now makes fertility domination inappropriate. This is due to the improved methods of contraception and an increase in family planning clinics and safe sex campaigns due to the AIDS scare.

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[1] Patriarchy is the system that tolerates and fosters gender inequality, ie it is a system that discriminates against women by which females become willing collaborators in their own oppression.

Figure 2 is a copy of a poster taken from a local further education college noticeboard and is clearly aimed at young women. This would support the idea that increasingly women are being given opportunities to take control of their own bodies. As to the other two characteristics, the provider and protector, these have clearly diminished as societies have become more civilised and as women are gaining paid full-time or part-time employment which is allowing them economic and social independence.

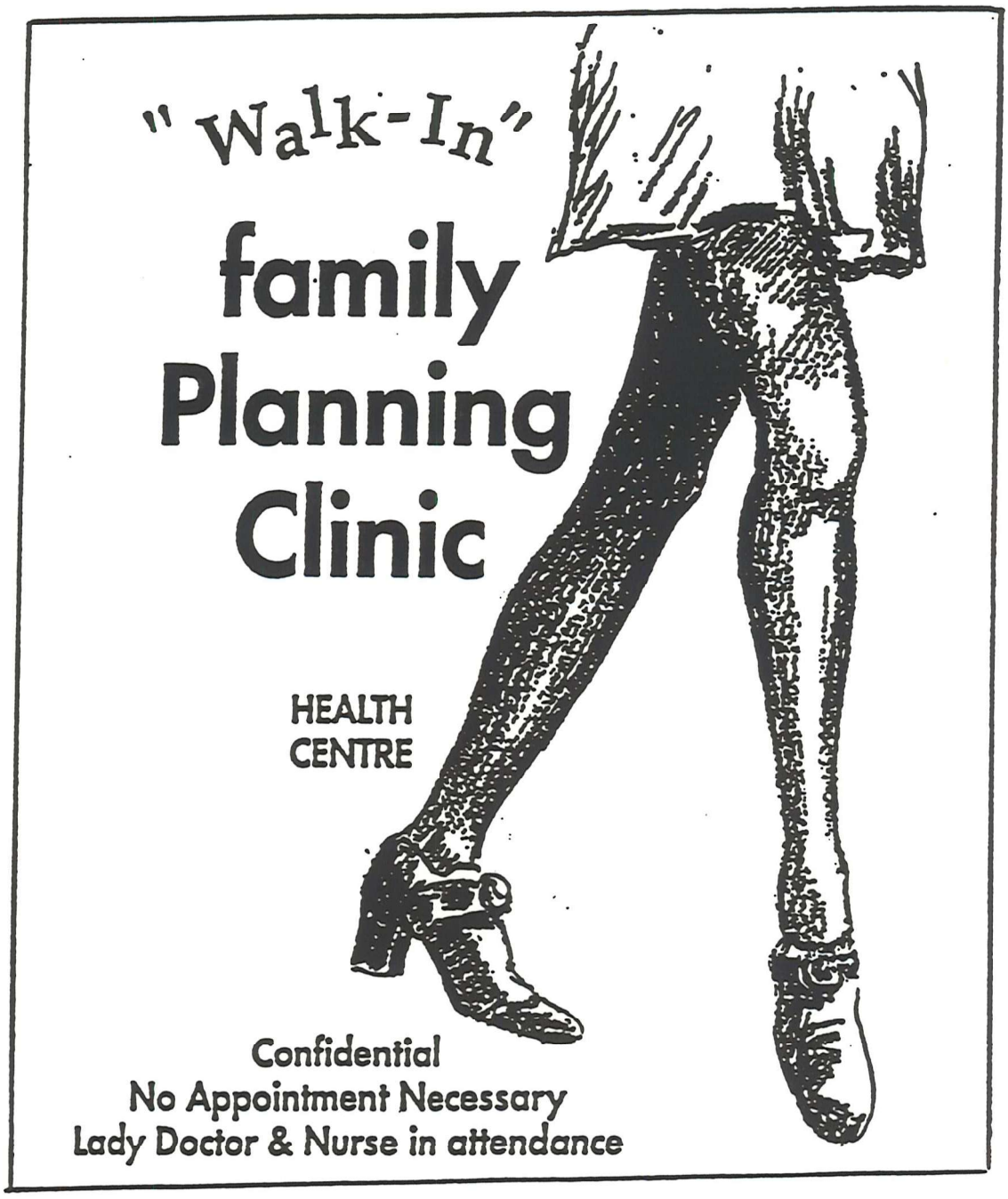

Figure 2
Poster advertising a local family planning clinic

SEX AND GENDER

What is meant by sex and gender? Do they both have the same meaning or are they different? It is important that these differences are looked at as they may have some bearing on attitudes, etc.

O'Donnell (1992, p169) puts forward the view that: "The sex differences approach is based on the theory that the main social differences between males and females are caused by, and are reflections of, biological differences. Women are considered biologically programmed for child bearing and related domestic work whereas men are regarded as naturally bread winners". O'Donnell and Haralambos (1980, p 370) further cite the view of Tiger and Fox (1972), who argue that: "The differences between the sexes are biogrammers".

Other explanations of gender differences have involved cultural flexibility on the biological basis. O'Donnell (1992, p 169) further cites Murdoch (1949) who sees the sexual division of labour with women bearing children and men doing tasks involving strength as a matter of practicality and convenience, ie each sex is biologically best suited to their respective tasks. (This view must now be rethought as modern technology is eroding the need for strength.) O'Donnell (1992, p 170) goes on to say that: "Gender roles are dictated by the particular society and cultural views". O'Donnell again gives examples where there is almost a reversal in traditional male and female roles. The example cited by him is that of the Wamiba where the family home, although built jointly, becomes the sole property of the wives and general work is equally divided, but one of the most female traditional roles - that of cooking - is carried out by the men. So the traditional male/female roles are possibly learnt through socialisation and not by an biological programming. This concurs with Oakley's explanation (1972, p 16) of the differences between sex and gender. She states that: "Sexual differences are biological in nature whereas gender differences are produced by culture". This means that gender differences can be changed or eroded provided there is a cultural change. This view is also supported by Birke (1992, pp 81-102).

Fildes (1989, p 113) also quotes Oakley's view (1972) of sex and gender as " ... being two distinct but separate conditions", but she then goes on to say that: "Recently a number of writers are beginning to question the view put forward by Oakley and others who profess to hold similar views". Fildes quotes writers such as Morgan (1986) and Birke (1986) who have raised a number of questions concerning this popular view. Both authors take the view that: "Sex and gender should not be viewed separately and discretely but are an interactive part of each other". Morgan (1986, pp 34-36) makes the point that what are taken to be biological facts are themselves socially constructed. Morgan gives an illustration of where biological and social attitudes combine. He cites that in the 19th century one argument that enjoyed a certain amount of credibility was the belief that men and women had fixed amounts of energies and that women used up much of their allocation through natural processes such as pregnancy, etc. Today, such a viewpoint may be largely discredited because of a better understanding of biological/hormone changes.

A second related difficulty highlighted by Birke (1986, p 71) and Morgan (1986, p 34-36) is that the conventional sex/gender distinctions encourages a tendency to view gender differences in essentially

dichotomous terms. Seeing gender in 'either/or' terms can result in us returning to ideas of biological sex, even though, as in the case of the hormones above, there is little biological justification for viewing male and female as mutual exclusive biological packages. Morgan (1986, p35) argues: "To adhere to a dichotomous construction of gender differences is to run the risk of reproducing often unconsciously stereotypical assumptions about men and women and of failing to do justice to the complex paradoxical and sometimes contradictory understanding of gender in contemporary society".

Family, school and later work through socialising is where gender behaviour is learnt and reinforced in order that a child/adult learns to act in a way acceptable by society. Traditional patterns of socialisation have a marked distinction between men and women but in the wake of the various women's movements this has started to create a change in this view.

The expectations of society are to some extent a way of keeping order within itself. If any person or group behaves in a way that is not considered to be the norm, they will be ostracised or thought of as being strange. Ellis (1971, pp 692-703) puts forward the view that: "People behave as they do primarily because they have accepted that certain norms are appropriate and thus they feel a moral obligation to conform". However, Corser (1976, p 154) argues that: "In modern sociology, this viewpoint is becoming eclipsed". This second viewpoint is now being shown to be factual rather than fictional when one considers how many gender traditional roles are being eroded. Consider for instance one of the most basic of women's traditional roles, that of the raising and caring for young children and babies. The term 'modern man' conjures up a vision of a man who is willing to share in the daily routine of rearing young children, eg feeding, changing nappies, etc, work which, only a few years ago, would have been unusual for a man to undertake. It is still not uncommon for some older men to openly boast that they never changed a nappy or bathed their children. Scanzoni (1978, p 8) states that: "Several studies suggest that increasing numbers of people are beginning to hold gender role preferences that are more egalitarian and less traditional than those held by persons some years before".

Scanzoni further quotes that: "The greatest changes in the direction of egalitarianism are in the attitude towards work, financial responsibilities, and the division of labour within the home". This view was further supported by the conclusions of a report carried out in several American colleges by Parelius (1975, p 51). Parelius also goes on to state that: "Women are changing more quickly than men and there are many reports that have found that men are less orientated towards egalitarianism than women". These findings have been supported by Scanzoni (1976). O'Donnell concludes his chapter on gender with this statement: "Women have taken some steps towards their emancipation and some men are beginning to respond and may take steps towards their own emancipation."

GREAT EXPECTATIONS

The economic development and changes in the work place and working practices have resulted in changes in the working market. It can be argued that in each case there is an element of discrimination in the disadvantage. The majority of women have taken the traditional routine occupations in offices, nursing and welfare professions. One of the main disadvantages for women

lies in the fact that the time and effort they put into child care and the household frequently damages their prospects.

At the start of the 20th century, prior to the start of the First World War, married women were not expected to work as society dictated that their role was in the home. Initially, at the very beginning of the First World War, there was a large increase in unemployment. As the war progressed, increasing numbers of men were required to serve on the front lines of battle. This resulted in a shortage of labour back in Britain. Women, whose role had always been in the home, were now needed to fill the gap left by the men and were being actively encouraged to go out to work. Most of the available work was in engineering and munitions factories - an area in which women had never before been involved in any way. They were now, however, expected to undertake a range of work - operating at levels ranging from basic to fully skilled. The unions entered into an agreement with employers and the government (Treasury Agreement) that in return for a 'no strike' policy, skilled men's wage rates would not decrease, and that women undertaking the same work would also receive the fully skilled tradesman's rate.

However, a few days after this agreement, the Employers Federation issued a note to its members stating that women should be paid the rate for youths and not adult men. This was allowed to happen because the government had by this time taken formal control of munitions which gave them power over the unions, without offering any guarantees on wages or prospects.

Therefore, even though the government of the day found it necessary to employ women to carry out jobs previously undertaken by men, they could not bring themselves to treat women equally when it came to pay. This pay differential has continued up to the present day. There have been several moves to erode this pay differential which included an Article 119 of the EU Treaties of 1957 which stipulated that women and men should receive equal pay for equal work. This Article was to exist on paper alone until 1975 when the Council adopted a corresponding directive. Although it was binding for all member states, its transposition into national law was left up to the individual states. However, this Act has still not been fully implemented in several member states for varying reasons. Polachek (1975, p 111) argues that the major casual factor determining male/female wage differentials are sex differences in continuous work experience. The result of women's discontinuous labour participation is that females both enter occupations requiring lesser amounts of training and train less even when in professions typified by much 'on the job' training. As a result of this, women make up the majority of employees in lower paid occupations and also receive lower pay in the higher paid professions.

Polachek (1975, p 110) also argues that: "If women did not show this discontinuity of work then they would earn the same as men". This view, however, is not the same as those found by Koppel and Appelbaum (1976, p 32) who argued that: "Committed women workers earn less than men, even when controlling for work experience". Therefore, they contend that the wage differentials can be attributed more to economic discrimination against women than to work experience or continuity. O'Donnell (1992, p 69) looks at the various Acts that have been passed to allow women to compete on equal terms such as:

(1) The Sex Discrimination Act 1975;

(2) The Equal Pay Act 1975;

(3) The Employment Protection Consolidation Act 1978;

(4) The Abortion Act 1967;

(5) The Divorce Law Reform Act 1969 (implemented 1971).

These Acts have allowed some level of equality but O'Donnell goes on to say that: "None of this legislation has resulted in a reduction of women employed in low paid occupations". This view is further supported by Ball et al (1989, p 159) who state that: "In 1986 women working full time made up approximately half the work force in clerical and related jobs and a further 20% were employed in professional occupations which included education, health and welfare, whereas women part time workers were largely employed in catering, cleaning and hairdressing which are, along with the full time occupations. poorly paid".

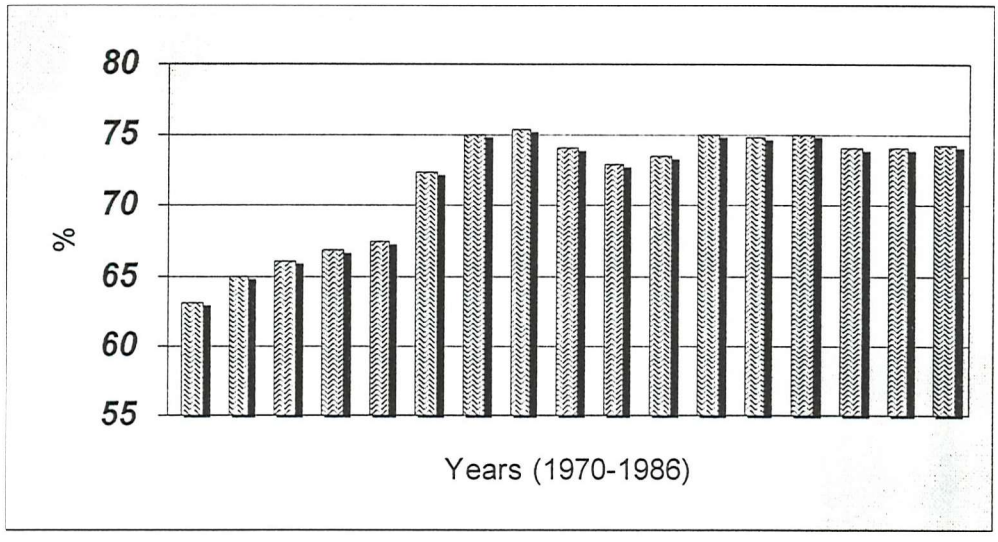

Figure 3

Women's average gross hourly earnings as a percentage of men's full time
Source: The Transformation of Britain: Contemporary Social and Economic Change

O'Leary pointed out in a national newspaper article entitled 'Women Step In to Boost Family Fortunes' in 1994 that women's average earnings grew four times faster than those of men between 1979 and 1991. This means that the average male contribution to the household budget has fallen to 60% of total income compared with a figure of 75% in the late 1970s/early 1980s.

		1951		1971		1981	
		Male	Female	Male	Female	Male	Female
1A	Professional - higher	2.6	0.5	4.9	0.6	4.9	1
1B	Professional - lower	3.2	8.2	6	10.9	7.5	15.7
2A	Employers, proprietors	5.7	3.2	5.1	2.8	4.4	2.3
2B	Managers, administrators	6.8	2.7	10.9	3.5	13.8	5.2
3	Clerical	6.4	20.4	6.4	27	5.7	29.1
4	Foremen, inspectors, supervisors	3.3	1.1	5	1.8	5.2	2.7
5	Skilled manual	30.4	12.8	29.3	8.4	25.5	5.2
6	Semi-skilled manual	27.6	40.5	20.7	31.5	21.9	27.6
7	Unskilled manual	14.2	10.6	11.9	13.6	10.2	11.3
	TOTAL (thousands)	13584	6930	15884	9138	15527	9879
	TOTAL (percentages)	100.2	100	100.2	100.1	100.1	100.1

Table 3
A comparison of increases between men's and women's employment between 1951 and 1981

O'Donnell (1992, p 184) goes on further to say that: "A more interventionist policy might, for instance, involve guaranteeing women a minimum quota of top and middle level positions in business companies and professional establishments". This would have the effect of destroying, as Ball et al (1989, p 159) put it: "The vertical segregation where women workers are concentrated in the lower levels of the various establishments".

Ball et al (1989, p 161) also illustrate this vertical segregation stating that: "The relative position of men and women in the occupational class structure evolved over the post-war period. Although women have become an increasingly important part of the non-manual workforce they remain much under-represented in what most people view as the most powerful and prestigious occupations" (as previously mentioned, in John Major's cabinet).

As a footnote, it is interesting to see what O'Donnell (1992, p 185) has to say concerning the Thatcher period. He comments that: "Little legislation was passed during this period aimed at remedying the inequalities within society that women still have to face. With one exception, that of the new tax ruling of 1990, this ruling now takes the earnings of husband and wife separately, which now allows a woman some privacy and control over their own financial affairs".

To sum up the moral argument, apart from the fact that it is surely wrong that society should fail to provide equal opportunities for over 50% of its future workforce, discrimination on the grounds of gender is socially unfair and morally wrong. Some organisations, such as the Armed Forces, have recognised this and have allowed women to enter previously male-only careers including engineering. In these instances when allowed to compete on a level footing with their male colleagues, women have proved themselves to be just as successful and highly competent, although even here, women cannot serve in certain roles.

ROLE MODEL

The number of women successfully completing craft level engineering courses is very small and although, as mentioned earlier, there is a general consensus that prejudice and discrimination exists, it is imperative that steps are taken to change society's attitudes towards women who choose to work in engineering. Prejudice cannot be eradicated overnight, and changing attitudes to women in traditionally male dominated roles is something that can only take place over a lengthy period of time. But, with the changes already in place (Sex Discrimination Act, etc) and an egalitarian view mentioned on p 13, this now may be the time to start making inroads into this last bastion of male-domination.

One way of eliminating prejudice would be to train successful women engineers who would then go on to pursue high profile engineering careers and who would act as role models for other women to emulate. The effectiveness of using role models to attract women into engineering was illustrated when, in a popular Australian television series, a young woman became an apprentice mechanic. The result was an increase in young women school leavers applying for motor vehicle engineering courses at colleges of further education. Motor vehicle lecturers and garage proprietors said that during this period there was an increase in the number of applications from young women either seeking courses or employment within the industry.

Gross (1993, pp 689-691) illustrates the effect that television and the media have on young people and cites various researchers such as Gunter and McAleer (1990), Frueh and McGhee (1975), Morgan (1982) and Williams (1986). Most of these researchers have differing views on who and to what extent television and the media affect young people. In his book, Gross has reviewed these authors' work and has illustrated their differing views as to whether young males or females are affected the most. Gross cites Morgan (1982) who conducted a longitudinal study of a large sample of teenagers over a period of two years and concluded that: "Television cultivates certain sex role attitudes but these effects are confined to girls. The heavier the viewer, the more likely they are to think that women are less ambitious and happiest among children".

Morgan also differentiates between middle and lower class teenagers to the extent that he states that: "The lower class teenagers who took part in his research were generally more sexist regardless of how much television they watched". Williams' research was carried out in Canada, and differed in that in his view " ... the television appeared to affect boys more in that any sex stereotyped messages broadcast were absorbed mostly by the boys".

Whichever view is correct is hard to say but all the researchers are agreed that: "Television and the media do affect stereo-typing". Williams concludes his work by saying that: "In the longer term television has the potential to shape children's sex role attitudes and recommended that special attention should be given to how women are presented on television". If more women are seen participating in and seemingly being successful in non-traditional work such as motor vehicle engineering, the argument that women are incapable of carrying out craft engineering work may begin to be questioned.

Although, of course, not all women would wish to take up a career in this area, but consider that throughout Europe, motor vehicle engineering is the most popular career choice for 16 year old male school leavers (see Table 10). It should, therefore, be reasonable to assume that a career attracting this amount of popularity from males should result in a reasonable representation of aspiring female motor vehicle engineers. However, this is not the case.

Government statistics show that at present in the UK trained craftsmen[2] constitute the largest percentage of the workforce. These statistics are reflected throughout the industrial world and include all aspects of engineering, eg mechanical, electrical, civil, motor vehicle, etc. (Operators[3] have a slightly higher percentage).

Table 4 indicates the numbers of male and female craftsmen and operators employed in light engineering and motor vehicle sectors in the UK in 1990/91.

Occupation	Number Employed	Male	Female
Craftsman	311,797	309,254 (99.2%)	2,543 (0.8%)
Operator	776,367	583,883 (75.2%)	192,484 (24.8%)
TOTAL	1,088,164	893,137	195,027

Table 4
Craftsmen and operators employed in the UK 1990/91
(Figures obtained from E.I.T.B. 1990/91 Annual Report)

Table 5 compares the number of men and women undergoing training in 1990/91 in order to pursue careers as craftsmen or operators.

Occupation	Number Employed	Male	Female
Craft Apprentice	22,324	21,867 (97.9%)	457 (2.1%)
Trainee Operator	10,585	7,677 (72.5%)	2,908 (27.5%)
TOTAL	32,909	29,544	3,365

Table 5
Craft apprentices and operators undergoing training in the UK 1990/91
(Figures obtained from E.I.T.B. 1990/91 Annual Report)

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2 **Craftsman** A person male or female who enters a career through a recognised apprenticeship.
3 **Operator** A person who requires at least one week of approved training in order to do their job satisfactorily.

These figures illustrate the fact that as a combined group there is a significant number of craftsmen and operators currently pursuing engineering careers in the UK but that of this group, only a relatively small number of them are women.

Simple breakdowns of the number of students and their courses at Weymouth College shown in Tables 6 & 7 show the disparity between male and female students on both motor vehicle and production engineering courses.

Course No	No of Students	Male	Female
C&GLI 383 Level I	15	15	0
C&GLI 383 Level II	17	17	0
C&GLI 383/2/2	12	12	0
TOTAL	44	44	0

Table 6
No of students enrolled on motor vehicle craft courses, Weymouth College 1991/92

Course No	No of Students	Male	Female
C&GLI 228 Level II	18	18	0
C&GLI 205 Level III	14	13	1
C&GLI 230-3-11/12 Level III	13	12	1
TOTAL	45	43	2

Table 7
No of students enrolled on production engineering craft courses, Weymouth College 1991/92

A similar disparity is apparent in the number of male and female students undergoing training on motor vehicle courses being run at Willesden College[4] shown in Table 8.

[4] The Willesden College programme covers college courses from craft level to HNC, or various courses including Electrical Engineering, Painting & Decorating and Upholstery. Motor Vehicle Engineering and Production Engineering, which attract the least number of female students, are not included.

Course	No of Students	Male	Female
Motor Vehicle Bodywork Fabrication and Welding	338	330	8 (2.3%)
Motor Vehicle Craft Studies (381)	276	258	18 (6.5%)
TOTAL	614	588	26 (4.2%)

Table 8
Motor vehicle craft courses, Willesden College 1991/92

These figures are not exceptional but give an indication of the situation with regard to the majority of college intakes at this level. In 1997/98 three female students were studying motor vehicle engineering, one in the first year and two in the second year. There were no female students studying engineering at any level.

In the interest of equal opportunities, Willesden College in London initiated a positive plan of action to encourage and support female students undertaking traditionally male dominated courses. This initiative was set up in the late 1980s and early 1990s, by the women's study group within Willesden College who, with the assistance of the relevant engineering sections, started a number of all-women courses. However, all of these collapsed as the women gradually left one by one.

It must be said that the high figures shown in Table 8 for numbers of women on mixed courses were not typical. The previous year, ie prior to the initiative commencing, only one or two girls had enrolled on engineering courses.

To date very little research has been carried out at the craft level. Tizzard (1990), Senior Lecturer at The Polytechnic of Huddersfield School of Education, took part in a small investigative project entitled 'Women and Girls on Engineering and Construction Courses in Further Education', the purpose of which was to investigate the situation of girls and women on engineering and construction courses at a college of further education. Her research, which was carried out at Keighley College, Yorkshire, concerned the problems encountered by girls entering traditionally male dominated courses.

WHY NOT CRAFT?

There is a general consensus among vocational trainers that in many training establishments there is a reluctance, caused by underlying discrimination, to offer places on craft level engineering courses to young women school leavers. Some of the reasons that are put forward to explain this reluctance by those who have influence in the selection of candidates, eg employers, members of training institutions, etc, include the following:

- Women should concentrate on traditionally female roles;
- The engineering industry is predominantly male-dominated and women would not fit in;
- Women do not have the necessary physical strength to undertake certain aspects of the work;
- Women do not like to get their hands dirty;
- It would be almost impossible for a woman to obtain employment after training;
- Women are only interested in getting married.

No doubt many other statements of a similar nature have been expressed by such people and by male and female members of society in general, but it has to be said that men in particular are more likely to be guilty of this type of prejudice. Whether they actually believe that these statements constitute valid reasons for preventing women from embarking on a career in engineering, or whether they are using the statements as excuses to prevent women from encroaching on their traditionally male domain, is unclear. However, the fact that when examined none of these statements can be considered valid does not prevent a significant number of young women from being actively discouraged from even considering a career at craft level in engineering.

Giddens (1992, pp 179-180) gives another common misconception aimed at women in the workforce. Although Giddens attributes it towards their lack of strength, it could be so easily aimed at the attitude of male workers towards that of female workers. The misconception that Giddens quotes is: "Women will get equality the day they are prepared to work in the mines". This statement highlights the misconception that male workers have for their female counterparts that they cannot carry out hard physical labour nor do they like getting dirty. However, what Giddens goes on further to say simply demonstrates that this is false. Giddens states that; "Women and children used to work in the mines and in fact the last 'pitbrow girl' retired in 1953". This surely indicates that women are just as capable of undertaking hard physical work in conditions that most men would not like to work in. In some USA mining companies, women are still employed underground.

The last reason (ie women are only interested in getting married) has been reinforced by The Carr Report (1958), The Crowther Report (1959) and The Newsom Report (1963). In all of these reports it was assumed that the main interest of girls was to be married and bring up children. In her work for the Open University, Wickham (1984, p 150) discussed this view to some depth and she points out that: "Many of the policies of the welfare state reinforced this view as women's dependency on the male wage earner". Also, Gilmore's view of 'man the provider' was implicit in many areas of its policy, thus reducing the pressure for any further training. Gilmore further cites that: "This view is strengthened by the continuing participation of women in the labour market and in spite of legislation concerning equal pay and opportunities it is still the case that the basic assumption is that the man is the provider and the woman is responsible for the maintenance of the household". These assumptions also seem to continue to guide policy makers.

Another reason commonly cited and which is founded on fact rather than prejudice, is that when girls have been offered places in the past, most of them have failed to complete their courses, usually leaving within 18 months of commencement. This is supported by research carried out by Valbjorn & Hansen (1992).

Therefore it can be seen that these two factors, prejudice and the high drop-out rate, may be combining to effectively deter women from applying for craft engineering courses, or if they do apply they may encounter difficulty in being accepted. The B & A Group report (1992, p 47) states that the girls who drop out prematurely give reasons such as professional or cultural difficulties, or non-acceptance by male workshop workers. When they gain a place, they may encounter further problems which affect their ability to persevere with their course. This state of affairs is likely to be further exacerbated by the government's policy of college incorporation (the removal of further education college establishments from local authority control) implemented in April 1993, allowing colleges to be self-governing with regard to their administration but dependent on a central funding council (FEFC) for the allocation of their yearly budgets. The effect of this is that the criteria for the selection of students have changed owing to the fact that the amount of funding will be allocated according to the level of retention of students and the percentage of course pass rates. Funding will be reduced if a course's retention rate is less than 90% per term and its pass rate less than 80%. Whereas before colleges selected students on the basis of the number of places available and on a 'first come, first served' basis, selection now depends upon the likelihood of success. Therefore, if there is an underlying assumption that female applicants are unlikely to be successful in completing their courses, there is a strong possibility that they will be denied places in favour of male applicants, even if their level of ability is higher, as colleges are unlikely to gamble with precious financial resources by offering opportunities to women who it has been shown are unlikely to succeed unless some form of special funding or allowance is made to encourage them to do so.

It must be said that not all engineering courses lose female students in this way and some female students have been successful in completing their courses. For example, higher level technician and graduate courses which attract a significantly higher number of young women than the craft level courses and for which female applicants do not appear to be subjected to the aforementioned discrimination (perhaps because of the 'white collar' nature of the work), are more likely to have larger numbers of women successfully completing. Courses at this level are well supported by a variety of outside bodies such as WISE (Women into Science and Engineering), The Engineering Council, COMMETT, and others. All of these organisations are very active in promoting courses, but not necessarily in supporting those individuals who have taken up the challenge of a career in engineering at this higher level (Table 11, Women in Professions).

Chapter 2

Chapter 2

INTRODUCTION

In Chapter 1, I outlined many of the barriers that prevented or discouraged women and young female school leavers from considering or taking up a career in engineering. I described how lack of physical strength, child bearing/caring responsibilities, the attitudes of male colleagues and customers, inappropriate educational qualifications, etc, were typically cited as reasons for discouraging female applicants for courses in engineering, and employment. In each case, I was able to demonstrate that these reasons were not valid in modern society, and offered positive reasons as to why women should be encouraged into engineering. In essence, on closer examination of these reasons, the one true barrier which affects recruitment is, as defined by Van der Craats et al (1992, p 27), 'attitude and acceptance', ie the attitude of society and the acceptance of women into traditionally male dominated areas. This barrier exists in all levels of engineering from graduate to craft, but it is more obvious at the heavily male-dominated craft levels. This view is also supported by Ball (1989) and O'Donnell (1992, pp 180-181) who have both stated that discrimination is felt more greatly at the manual levels (see Figure 7).

To obtain acceptance and change attitudes it is necessary for female students on engineering courses to succeed, ie to complete their courses, to obtain all relevant qualifications and obtain full-time employment within their chosen career. More role models are needed to show that a girl can be successful in a male-dominated trade. Webb (1982), Salvage (1986, p 23) and Beishon (1995, pp 38-41) illustrate the effect of role models on males entering nursing. Salvage states: "Men suffer from stereotyping through the lack of images of men in nursing in the media, although several TV series have tried to redress the balance and have shown male nurse characters".

This research was initiated to establish the reasons why so few girls failed to complete their craft engineering and motor vehicle courses. The research itself will try and establish answers for two fundamental questions:

(a) What are the factors affecting the retention of young female engineers on craft level courses?
(b) What action can be taken to retain young female students and help them to progress?

Before answering these questions it will be necessary to make a comprehensive study of all factors which affect retention, including problems associated with recruitment, retention and ultimately the successful completion of the course.

The first part of this research, that concerning recruitment, was problem-free, as there is at present a great deal of information published about the recruitment of women into engineering. Organisations such as WISE and COMETT in the UK, and PETRA and EUROTECNET in the EU were originally set up to promote engineering as a career option for young female school leavers. However, when it came to the second part, that of retention and final success of young women in engineering -

particularly at ***craft level*** - there was sadly very little relevant information. During the five years of this research, I have only been able to discover two reports which primarily deal with training strategies and these mention poor retention only briefly, despite the fact that they consider it a major problem. Both of these reports are reviewed in the second part of this chapter which deals with the retention and final success. Therefore, although retention is seen as a major problem, it would seem no-one has as yet established why, and it is for this reason that this research has been undertaken.

RECRUITMENT

Schaffner (1990, pp 22-23) writes concerning the problem of nursing shortages in the USA. He suggests that the recruitment of men is an untapped resource which has not been fully exploited and suggests that an active recruitment campaign should be started. This situation is the mirror image of that being experienced in engineering where women are the untapped resource.

In both professions, recruitment of these untapped resources is proving to be difficult. To overcome this problem of poor recruitment, Moule (1995) suggests that effective marketing which addresses influences of the media and the use of role models should be employed. This suggestion is further endorsed by Villeneuve (1994) who has carried out a review of recruitment and retention of male nurses in Canada. Villeneuve also states that a lack of exposure to male nurses is affecting the recruitment of potential candidates. To overcome this problem of poor recruitment, Villeneuve also suggests that the use of role models and the exploitation of appropriate media sources are feasible strategies which would have an affect on changing the gender imbalance in nursing. Both of these authors emphasise the importance of high profile (ie manipulation of media) of recruits (ie role models) who have been successful and gained their appropriate qualifications in order that potential candidates may be encouraged to enter the nursing profession. From this, I consider that recruitment, retention and eventual success are all dependent upon each other. Without recruitment there can be no retention and success. Without retention there is no success, without success there is poor recruitment (see Figures 4 & 7, pp 25 & 62).

This argument is further supported by Webb (1982), Beishon (1995), and Abraham & Shanley (1992) who all cite the example that until 1940, men were banned from entering general nursing. Salvage (1986, p 8) cites that The Royal College of Nursing actually excluded men from entering their organisation until 1960, but now have a male general secretary. Salvate writes (p 6) concerning the recruitment of male nurses who now make up ten per cent of all general nurses noting that this has become possible due to a small increase in recruitment which has led into an increase in qualified male nurses which others now follow. Gaze (1987, pp 25-27)) also highlights that ten per cent of general nurses are male, and this again has been brought about by successful recruitment. Abraham & Shanley (pp 99-101) also claim that with a high profile exposure of male nurses, there becomes an acceptance by society where patients will accept being treated by male nurses. Abraham, however, does point out that some limitation may be imposed by some female patients, ie midwifery.

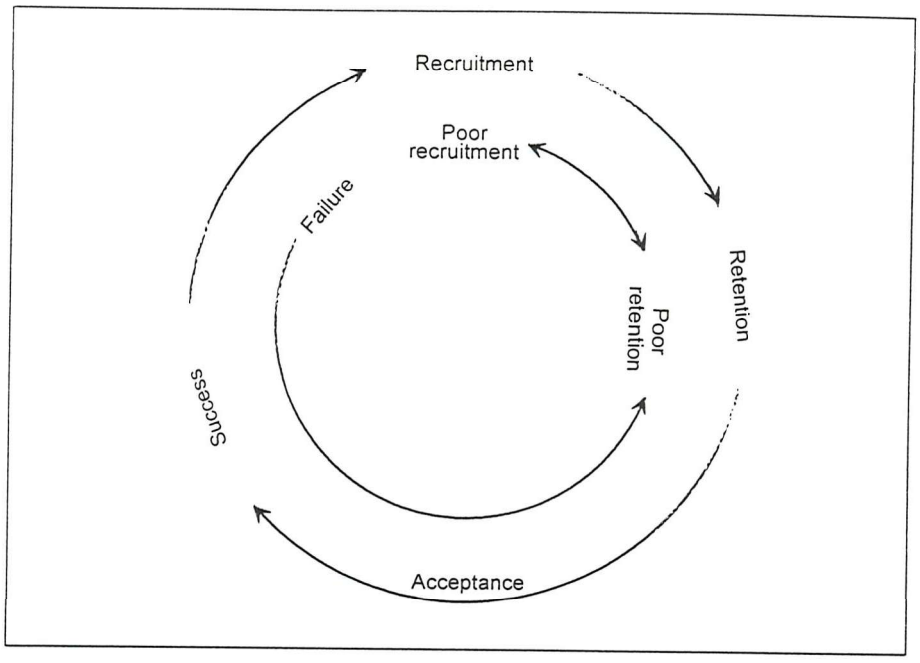


Figure 4
Cycle of rcruitment

In this chapter I intend to highlight the evidence of the need to recruit more engineers at all levels, and show the reasons why it is necessary to recruit more women, particularly at craft level. I will give an overview of two high profile British organisations actively involved in the recruitment of women on to engineering courses at graduate level, and discuss the reasons they give as to why craft has been neglected. Suggestions as to why so few school leavers are recruited on to craft level engineering courses at present will be given, and I will describe the major EU organisations that have been charged with promoting the training of women and discuss their mandates and current activities.

WHY RECRUIT?

With the increase in advanced engineering and electronic technology the recruitment of able and well trained personnel is essential for any industry to stay alive, and more so today. Beishon (1995, p 33)) writes: "Assumptions and stereotypes about minorities can affect selection decisions and a recruitment system that disadvantages any particular group is a waste of talent and skill". Coupled with this potential wastage, the reduced birth rate which occurred in the mid 1970s has resulted in fewer 16-year olds leaving school. This situation is expected to continue into the early part of the next century which will result in a shortage of labour within the employment market. The engineering industry is therefore having to compete for these lower numbers of school leavers. If, as predicted by bodies such as the CBI and EnTra, there is going to be an upsurge in production by the mid 1990s, skilled workers will be at a premium. Providing there is no break in the training cycle, recruitment is the first step towards final success (every great journey starts with a single first step). It is, as I mentioned in the previous chapter imperative that more successes are achieved to provide future role models to act as aids to recruitment (see Figure 7, p 62).

However, as I shall point out in the section dealing with the EU and British recruitment organisations, the majority of recruiting organisations are only concentrating on recruiting at the graduate and technician levels. Failure to recruit at the craft level will possibly result in a severe shortage of skilled craftsmen leading to a situation where the adage 'all chiefs and no Indians' applies, ie a high number of high level engineers but inadequate workshop level engineers.

Why Recruit Women?

The CBI (1991) and EnTra (1993) have now recognised that women constitute a valuable human resource and this is one of the reasons why there is now an emphasis being placed on the encouragement of women to return to work, in the hope that the shortfall created by the reduced number of school leavers will be bridged. These projects are now being funded by government training and funding agencies, ie the TECs. It is therefore imperative that training institutions and the engineering industry as a whole recognise the fact that women make up an important part of the future workforce and take urgent steps to offer encouragement to all potential engineers from both sexes.

There is one engineering discipline which does not suffer poor female recruitment, this is electrical/electronic engineering (a relatively new area of engineering). Greater numbers of women are employed in this area at all levels, probably because physical strength is not a prerequisite for the job, and possibly because it has a 'cleaner' image. This fact is illustrated in Table 9.

Industry	Male Employees %	Female Employees %
Mechanical Engineering*	85	15
Electrical and Electronic Engineering	69	31
Motor Vehicle Engineering	88	12

*Care should be taken with these figures as Mechanical Engineering includes industrial plant and steelworks, mining and construction machinery. Motor Vehicle Engineering includes parts, an area where a high proportion of women are employed.

Table 9
Employees in employment
(Employment Gazette, 1991)

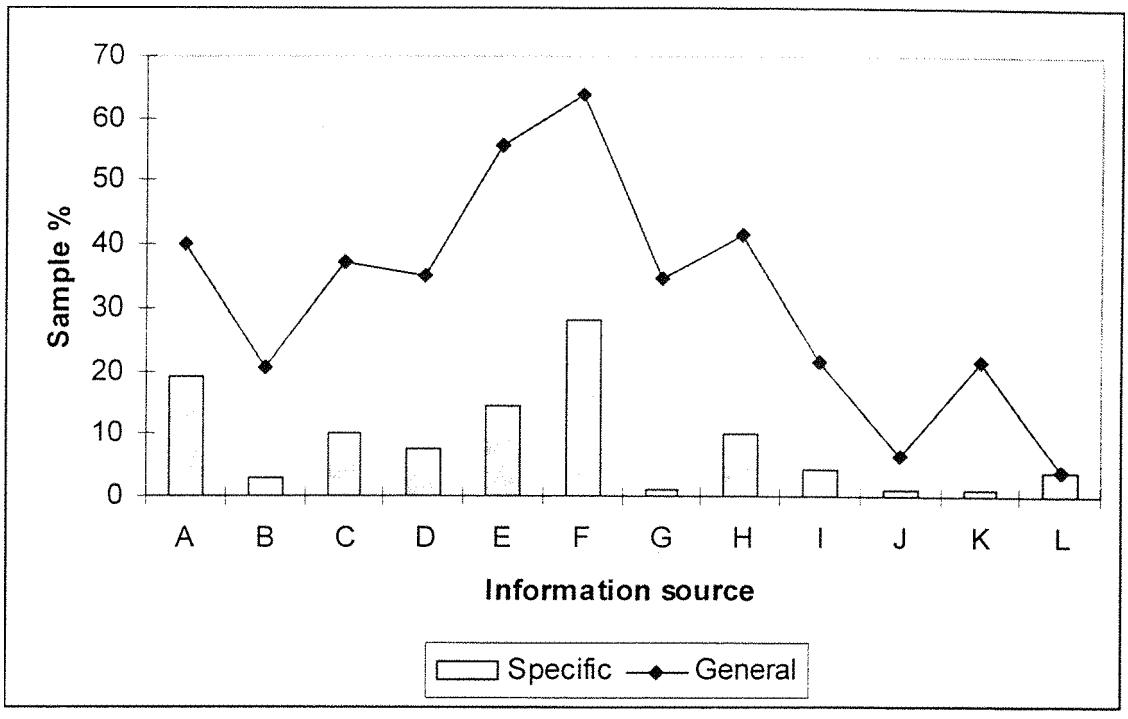
Training Occupations	Male Trainees	Male Trainees %	Training Occupations	Female Trainees	Female Trainees %
Car mechanic	77,134	7.7	Hairdresser	61,585	8.4
Electrician	48,332	4.8	Office clerk	49,639	6.8
Machinery fitter/assembler	39,862	4.0	Sales assistant	49,681	6.8
Painter/lacquerer	31,889	3.2	Specialist sales assistant - food industry	48,591	6.6
Joiner	31,674	3.1	Clerk in industry	42,557	5.8
Clerk - Wholesale foreign trade	28,475	2.8	Doctor's assistant	35,035	4.8
Gass and water supply fitter	27,885	2.8	Clerk in retail trade	33,929	4.6
Bank clerk	27,205	2.7	Dental assistant	29,670	4.1
Clerk in industry	25,299	2.5	Bank clerk	28,989	4.0
Baker	24,684	2.5	Clerk - wholesale foreign trade	22,248	3.0
TOTAL	362,439	36.1	TOTAL	401,924	54.9

Table 10
The ten most popular training occupations for male and female trainees in 1987
(Equal Opportunities and Vocational Training 13 Years On - The results of CEDEFOP's programme for women 1977-90)

Table 10 shows the ten most popular training occupations for male and female trainees throughout the EU. When the statistics presented in Tables 5, 9 & 10 are viewed, they clearly show that in the United Kingdom and the European community, motor vehicle engineering (closely followed by mechanical engineering) is the most popular career choice for male trainees, but only has a very small concentration of females.

Why So Few Women?

As this research is dealing with young school leavers it is necessary to look at who or what will have the largest influence on their choice of career. In his study Hesketh (1996) points out that the main source of information on careers is from careers advisers and teachers. Figure 5 below illustrates that the greatest amount of information and careers advice is given by careers advisers and teachers.



A	=	FE/HE open evenings	G	=	School friends
B	=	FE/He presentations	H	=	Parents
C	=	FE/HE literature	I	=	Brothers/sisters
D	=	Careers open evenings	J	=	Grandparents
E	=	Teachers	K	=	Family friends
F	=	Careers teachers	L	=	Others

Figure 5
Information sources

Few girls enrol onto engineering courses each year. This is clearly illustrated by Tables 5, 6, 7 and 8 (Chapter 1) which show the total number of girls enrolled on motor vehicle and engineering courses at Weymouth, Willesden and Bridgend Colleges during the same period of time. This low intake raises questions about the kind of advice offered to them in school when they are choosing their options in areas that have been traditional 'boys' subjects, and also about the careers advice given to them when they are considering a career in engineering. In fact, Abraham & Shanley (1992, p 101) also raise the question of adequate careers advice given to those seeking employment in nursing. They cite work carried out by Hackett & Betz (1981) who suggest that a limited array of successful women role models and the lower expectations of those advising woman of career choices (including teachers and counsellors) result in diminished career ambitions. Further to this, Abraham & Shanley (1992, p100) also cite Choon & Skevington (1984) when writing about male and female nurses and their careers, that differences in attributions for success and failure lead to men obtaining higher self-esteem whilst women will become discouraged and settle for lower career prospects. Beishon (1995, p 183) also cites a similar argument when she deals with the question of black nurses whose career aspirations are much lower than their white counterparts. She argues that demotivation may be due to the experiences, discrimination and lack of role models from the past. This demotivation leads to a lower sense of self-esteem and self-worth - in essence, poor motivation and a lack of successful role models which leads to poor recruitment and perpetuates the problem of poor advice.

During the course of this research I have had many discussions with teachers, students, parents and female workers employed in a wide variety of areas, such as hairdressing, secretarial and other traditionally female-dominated occupations. From these discussions it became apparent that many teachers and careers advisers shared the popular general perception of engineering - that it is a career suitable only for boys with little academic ability who were not destined to progress to any form of higher education, ie a 'dead end' job for boys. It was generally felt that the female engineers were highly unlikely to gain employment and, to quote one student, they would have 'no hope in hell' of finding a job. This is echoed by O'Donnell (1992, p 177) who makes the comment that the majority of people consider that engineering is a career for boys only. These perceptions clearly illustrate the uphill battle that recruitment organisations face when trying to encourage young girls into engineering, ie attitude and acceptance (see Figure 7, p 62).

BRITISH RECRUITMENT ORGANISATIONS

Several organisations exist to encourage women into careers in engineering. These organisations have enjoyed some success at the higher levels and the number of female graduate engineers has increased. A direct result has been that the number of women studying engineering at higher education levels has risen from 7% in 1984 to above 15% in 1991. It follows, therefore, that if this can be achieved at higher levels, there is no reason why success should not be achieved at the lower levels of engineering such as craft. However, the majority of women who enter this profession at the graduate level are aiming at careers in management, research and development, or design, and not at the more visible workshop level.

Table 11 below illustrates that even with the increase in the recruitment of women at the graduate (professional) level, there is still a large gap in the ratio between male and female professionals, particularly in engineering.

	Men %	**Women** %		**Men** %	**Women** %
Accountants	90.3	9.7	Engineers	99.5	0.5
Architects	92.2	7.8	Solicitors	78.6	21.4
Barristers	79.8	21.2	Surveyors	94.3	5.7
Dentists	76.8	23.2	Vets	73.5	26.5
Doctors (GPs)	77.6	22.4			
Doctors (Surgeons)	96.8	3.2			

Table 11
Comparison of men and women in professions

Two high profile recruitment organisations which have been successful in recruiting women are WISE (Women into Science and Engineering) and EnTra (Enterprise Training Authority).

WISE was launched in 1984 by a joint venture between The Engineering Council and The Equal Opportunities Commission. The main aim of this campaign has been to help change the attitudes of young people, parents, teachers and others, and promote engineering as a career for both sexes.

The second organisation, EnTra, was previously known as the EITB (The Engineering Industry Training Board) and was originally set up to oversee the training of engineers. In the mid to late 1970s the EITB launched various initiatives aimed at encouraging women into engineering, eg scholarship and grant schemes (first introduced in 1978) superseded by the INSIGHT scheme introduced in 1984. Both of these organisations concentrate on the graduate/technician level engineer. During the course of this research I held a telephone conversation with a representative of WISE (The Engineering Council), and the following reasons were cited:

1. They feel that it is easier for women to be accepted at this level and be viewed as successful, thus acting as role models for aspiring young engineers with appropriate qualifications.

2. Because WISE is associated to the Engineering Council, they must comply with their Royal charter which stipulates that they must concentrate on graduate/technician training.

A comment made during another telephone conversation which I had with a leading engineering body dealing with women in engineering may also sum up the reasons why the majority of bodies do not concentrate on craft apprentices. The comment was "engineering is a profession and is only open to graduates and technicians, and engineers are fed up with people who wield spanners around with very little knowledge and call themselves engineers".

This view is further supported by an article in the 'Professional Engineering' magazine (August 1994, Volume 7, No 14) in which it was stated: "Mending cars is not what an engineer does and the engineering institutions and The Engineering Council have done much to change the public's perception of the profession". If this is the view taken by leading bodies then it is not surprising that craft level engineering is not actively supported by recruitment organisations.

As to the question 'Why recruit graduates?', the EITB gave similar reasons to those presented by WISE for only recruiting graduate and technician engineers in their 1984 paper, stating: "These are the areas of greatest importance to the future prosperity of the industry. They are also occupations where women are more able to compete and contribute on an equal footing with their male colleagues." However, no evidence was given to support this statement.

In the early 1990s, the EITB changed its name and became EnTra. They have now disassociated themselves from this EITB statement and have come to realise that it is now just as important to recruit at craft, as well as graduate/technician levels. EnTra now has a policy of equal opportunities

and to assist in their recruitment programme, they have produced a video and various pieces of literature aimed at both young men and women.

Figure 6 illustrates that it is possible for a school leaver to enter engineering at craft level and progress to graduate level. However, my experience of interviewing prospective students for motor vehicle courses has led me to believe that teachers and careers advisers are unaware of alternative routes to university or high level qualifications other than the academic route (GCSEs and A levels leading to a degree) and perpetuate the view that entering engineering at craft level cannot lead to high level career prospects. This is supported by Hackett & Betz (1981, pp 326-329) who discovered that career teachers/advisers advocated that the only route to universities is via the A-level route.

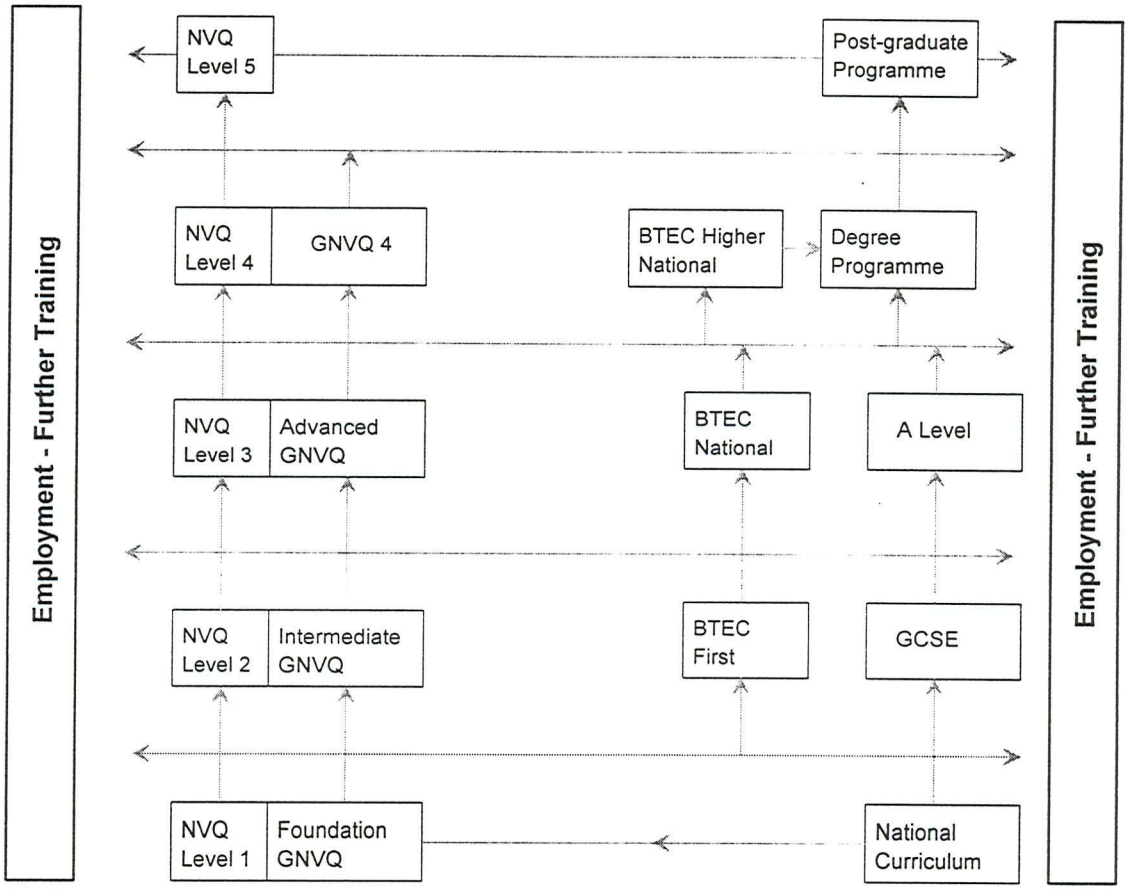


Figure 6
Route to employment or university via craft (NVQ) and BTEC qualifications

A truly professional engineer possesses an all-round knowledge of their subject from the ground level upwards, and not from the top downwards. After all, a graduate engineer who has followed an academic route is unlikely to possess a knowledge of basic engineering practices and will have no working experience at a practical level. A similar view is taken by Beishon (1995, pp 33-34) when she discusses recruitment. She emphasises the need for the recruitment of staff to be carried out by recruitment staff who are fully trained and have a good grass root knowledge of recruitment and associated policies. This is done to ensure that the best candidates for the jobs are recruited and therefore attainment of the highest standards are achieved.

At the management levels, Keep (1993, pp 327-328) writing about corporate training strategies highlights several research reports carried out by Mangham & Silver (1986), Handy (1987), and Constable & McCormick (1987), underlined the extreme poverty of management education and training in Britain. Keep further goes on to quote a study carried out by Steedman & Wagner (1987) who undertook a comparative study of matched manufacturing plants in Britain and West Germany. They looked at the qualifications held by the total workforce including management. They found that only ten per cent of the workforce in Britain held vocational qualifications as opposed to ninety per cent of the German workforce. This, Steedman felt, was a serious problem which should be remedied to improve the industry. Managers should have a comprehensive knowledge of the industry and its grass roots.

EUROPEAN ORGANISATIONS

The following are major EU organisations which have been charged with promoting the training of women.

1. NOW
2. EUROFORM
3. PETRA
4. FORCE
5. EUROTECNET
6. COMETT
7. ELISE
8. IRIS/CREW
9. CEDEFOP

NOTE: As from January 1995, COMETT, FORCE, PETRA and EUROTECNET were amalgamated and come under the title of Leonardo de Vinci (Ref Official Journal of the European Communities, Preparatory Acts, 4.3.94).

Brief descriptions of each organisation's mandate and current activities have been extracted from the IRIS evaluation final report (1992).

NOW

NOW came into existence in July 1991. Firstly, it encourages and finances support services and training for women trying to become self-employed in areas of male domination. This also includes women who are trying to set up co-operatives. Secondly, it finances labour market advisory services and counselling for women who are long-term unemployed, or those who are insecurely employed.

Thirdly, vocational training can be financed for these women and some selected child care facilities are offered. NOW operates through trans-national partnerships.

EUROFORM

EUROFORM was launched along with NOW in December 1990 and the first projects came on-stream in January 1992. It is a funding programme focusing on support for trans-national projects related to innovation and new skills diffusion in relation to the training of unemployed of either gender.

FORCE

FORCE is concerned with training employees rather than the unemployed. It offers financial support for investment in continuing vocational training and innovations in training management. It provides a network for innovatory trans-national initiatives in continuing vocational training and runs an exchange programme and funds international pilot projects. FORCE is a particularly large programme and one which draws in employers to trans-national partnerships working through co-ordinating units in each member state.

PETRA

PETRA has a 400 member European Network of Training Partnerships (ENTP) and a network of 'youth initiative projects' in which pilot training and employment schemes are designed by the young people themselves. Additionally, there is a research network consisting of 14 research partnerships. Each partnership brings together research institutions chosen by national governments to take part in joint research on issues related to youth training. There is an annual directory giving a profile of each ENTP project and a database is being developed which includes inter alia a list of working papers, teaching materials and course modules prepared by each ENTP member. Summary reports have been prepared for most member states on recent developments in training policy and practice.

EUROTECNET

EUROTECNET is concerned with provision of innovative actions in the field of vocational training to deal with technological change and with identifying new skill needs in the workforce. EUROTECNET does not fund projects. It is a network of 'best practice' projects as proposed by member states. The programme involves both sides of industry and is closely co-ordinated with FORCE, COMETT and PETRA through the Human Resources Task Force. The first phase of the programme (1985 to 1988) was concerned with training for new information technologies. The second phase focuses on a broader range of human resources, issues relating to technological change and their organisational implications. It is attempting to identify training needs and appropriate training methods in relation to computer controlled design and manufacturing systems, technologies to protect the environment, and bio-technology.

COMETT

COMETT's main focus is the transfer of high technology internationally between universities and enterprises. It is based on 158 University Enterprise Training Partnerships. These may be of a regional or sectoral kind, each bringing together up to several other partners who may include academic institutions, enterprises and professional associations. Funding is provided for trans-national students and graduate work placements, and exchanges of personnel between industry and academia and pilot training.

ELISE

ELISE (The Network of Local Employment Initiatives Information Service) provides an information service with the objective of promoting local employment. It holds information on commission programmes, organisations and local projects, and also provides an enquiry service through its database. ELISE produces a regular newsletter about current developments of interest to LEIs and has an extensive library on related topics. As an information service ELISE also helps projects find out which EU and national networks are available or appropriate. At the time of writing it has been decided by the commission that ELISE will not continue.

IRIS/CREW

The official launch of IRIS took place in December 1988 at a conference in Brussels attended by the 71 original member projects and national representatives of Equal Opportunities and Vocational Training Authorities. The main activities of IRIS began following this conference in 1989. These activities were partly determined by the Commission at the outset of the programme but have since been widened through discussion between CREW and the Commission. The objectives of the IRIS network were defined by reference to the Commission's recommendation to member states and women's employment training. The target groups were defined as women in general, and more specifically, unemployed women, women returning to the labour market, and working women at risk of redundancy. The programme's objectives were defined to be the promotion of demonstration projects in the field of vocational training for women, especially to encourage innovative projects and inventorise existing projects, and to disseminate examples of good practice and to bring a trans-national character to women's training projects by means of exchange visits.

CREW carry out the day to day management of the programmes and the Commission for IRIS. Events and activities are aimed not only at promoting exchanges of experience between members, but also at promoting women's training and influencing policy makers, employers and other influential groups.

IRIS has great potential and since its ordination in December 1988 it has seen a steady increase in the number of its projects for the vocational training of women. Although IRIS is now the main co-ordinator for women's vocational training, it suffers from some fundamental problems, one of which is its funding - or its lack of funding. In the IRIS evaluation final report (1992, pp 124-126) there are

fourteen recommendations listed which are subject to discussion with the Equal Opportunities Unit and CREW, which if implemented could allow this network to start achieving its full potential.

CEDEFOP is set up as an organisation of vocational specialists who help and assist the European Community in devising and implementing its vocational training initiatives. CEDEFOP (European Centre for Development of Vocational Training) has a remit to inform, conduct research and consult. Although CEDEFOP previously had work programmes which targeted women's groups, they had recently ceased to do so. The reason why there has been a policy change is not very clear. All that can be established is that it was a management decision which did not placate many CEDEFOP operatives.

Direct Target Groups or Intended Direct Beneficiaries of European Networks

	Individuals					Employers and Institutions			
	Unemployed		Employed		Students	Employers	Universities, colleges and researchers	Training Providers	Trade Unions
	Women	Men	Women	Men					
IRIS	•	•	•	•				•	
NOW	•		(in certain regions)						
EUROFORM	•	•							
PETRA	Youth				Apprentices/ trainees under 28	•	•	•	•
COMETT					•	•	•	•	
EUROTECNET			•	•		•	• (researchers)		•
FORCE			•	•		•		•	•
ELISE	Intended beneficiaries are LEIs, and indirectly, those who are or will be employed or trained in them								

Table 12
Evaluation of the IRIS network

IRIS ACTIVITIES IN SOME SELECTED MEMBER STATES

IRIS is the only European organisation which has been set up to co-ordinate craft training in the EU. For this reason, an overview of the IRIS projects is given in the following section. The level of success of the IRIS projects throughout the EU varies from one member state to another. If one or two projects are viewed, they give an idea of the difficulties faced by IRIS and this allows the difficulties to be more easily understood. The following extracts are taken from the IRIS evaluation final report and cover the constraints and specialisms that are associated with projects within several of the member states.

United Kingdom

Characteristics of IRIS Projects in the UK

The specialisms most common in UK projects are training in computer programming and in construction trades.

Operation of the IRIS Network in the UK

At least two thirds of IRIS projects belong to the Women's Training Network, an informal network of women's projects which are funded by the ESF. It came together independently of IRIS, but IRIS has helped to formalise its activities. It monitors the activities of the Training and Enterprise Councils and also works with them.

IRIS has no real impact on national policy in the UK, because of the lack of any formal mechanism through which this could take place. The view of the UK IRIS conference (1992) was that it was preaching to the converted and few employers attended. It is felt that more could be achieved if there was a national IRIS co-ordinator.

Portugal

Characteristics of IRIS Projects in Portugal

There are only nine projects in Portugal. Four of them involve training women for enterprise creation, but none in non-traditional skill areas.

Operation of the IRIS Network in Portugal

The development of the network in Portugal has been relatively weak owing to a number of factors.

1. IRIS is not primarily a funding programme and therefore is not attractive to employers.
2. Lack of funds has prevented representatives from attending meetings in Brussels.

3. There is no national co-ordinating unit for IRIS.
4. Exchange visits have been hampered by language problems.

It is felt by the Portuguese representatives in the Working Party on Women's Vocational Training that the Portuguese authorities should have a say in the choice of projects, to participate in exchange visits, and also that IRIS literature should be more widely distributed.

The Netherlands

Characteristics of IRIS Projects in The Netherlands

The Dutch projects include a large variety of experience in technical training of women in non-traditional skills, including electrical engineering, heating system installation, and computer aided design. There are also some projects offering special support to migrant women.

Operation of the IRIS Network in The Netherlands

It is difficult to judge the level of awareness of IRIS. Civil servants and training providers form a small 'circuit', and are thus reasonably aware, but in general, politicians and employers do not know of IRIS. The national conference in UTRECHT in June 1990 had a considerable impact, but really needed a follow-up event. There is a national co-ordinating unit for IRIS run through CIBB.

There are also two important national networks based around the Women and Workshops and Women's Vocational Training Centres, and a number of other networks in the field of vocational education and equal opportunities. This raises questions about the additionality of IRIS activities in networking.

Although IRIS can act as a multiplier of existing initiatives and has played a role in stimulating NOW initiatives, the possibility exists that these effects would have been present even in the absence of IRIS.

Greece

Characteristics of IRIS Projects in Greece

There is only one specialism in Greece, and that is for the training of women with higher educational qualifications in order that they may enter into management portions in male dominated fields.

Operation of the IRIS Network in Greece

Only nine projects have joined IRIS in Greece. This may be because of the lack of support from government institutions. It is perhaps regrettable that only one of the projects in the network is

involved in enterprise training, given the importance of this field for Greek women. It would be valuable for IRIS to attract and support more enterprise-related projects.

Compared to Italy, Spain, or some northern member states, Greece has not experienced a strong development of positive actions for women in employment, nor of specific support for women in the mixed training schemes which are the general form or provision for unemployed women. Thus an adequate structure for the exchange of information with other countries is perceived by The General Secretariat for Equality as an important need and the experience of participating in IRIS is recognised as having been very valuable. However, in the future the role of IRIS may be sustained by the new NOW co-ordinating unit.

Germany

Characteristics of IRIS Projects in Germany

These cover training in environmental conservation related areas, in solar energy generation, and the use of water power to help unemployed rural workers to re-train as environmental inspectors. Also, pre-training and support for women entering mixed courses in non-traditional areas.

Operation of the IRIS Network in Germany

IRIS has been swift to respond to the needs for women which has arisen from the employment crisis following reunification. The Federal Government has recently funded GIP to co-ordinate the IRIS network in Germany. GIP commissioned an extensive survey of women's training needs and employment problems in the eastern Lander which was reported in the IRIS bulletin in autumn 1991. IRIS projects have been active in advising their eastern counterparts and setting up new projects for women in East Berlin.

Awareness of the IRIS network is fairly high amongst civil servants concerned with labour market policies, and training in particular, and amongst politicians who have taken an active interest in promoting equal opportunities, but it is little known amongst private sector employers.

The growing interest in women's training opportunities amongst politicians arises out of a wider debate on skills shortages on the one hand, and an increased awareness of equal opportunities issues on the other. It has given IRIS prominence amongst this group albeit only recently. It is believed that IRIS will have a greater impact in the future because of the developing interest in training geared towards women. The networking of women's training projects has helped to make their presence more visible and demonstrates an existing need and demand for training that addresses the particular situation of women. Although this need is recognised in the Labour Promotions Act (APG), the realisation of this legal basis requires political input and of course funds. Thus the existence of a network helps to increase pressure on politicians and provides ample evidence of wide demand for the women's training opportunities.

The lack of interest from employers in women's training programmes implies a need for a wider publicity campaign which it is hoped to achieve through the publicity campaign planned by GIP. This may compliment the government's own initiative on raising awareness through publicity campaigns, which encourages employers to show greater flexibility when recruiting labour and to view women as potential employees, especially in areas of work where they are under represented. In this connection, it is noticeable that despite the impression that some German companies have adopted, women's training policies which could be of national and international interest, only one of the IRIS projects is a company-sponsored scheme.

These brief descriptions give an idea of the successes of the IRIS projects, but they also outline some fundamental problems that are associated with this network.

RETENTION

Recruitment by organisations such as WISE, EnTra, etc, is at present an ongoing event which is successful in recruiting graduate engineers but not at the craft levels. Graduate recruitment of women has actually increased. However, all the recruitment organisations contacted said that once recruitment had taken place, little or no support was offered. As illustrated by Van der Craats et al (1992), without support of any kind the student will find it difficult to proceed.

We have all experienced situations where we have felt uncomfortable in a group, for example where we have felt that all eyes have been upon us, just waiting for us to make a simple mistake for which we will be ridiculed. To have to experience this kind of threatening situation day after day with no-one to talk to or turn to for help would inevitably lead to feelings of inadequacy, low self-esteem and a desire to escape. It is this environment that a girl in a non-traditional career will very likely have to tolerate. This fact is borne out in the interviews I have carried out and in the responses I have received from questionnaires (see case studies). Support is the key element that is missing throughout the recruitment and training of young women in all levels of non-traditional careers. No training scheme in Britain provides specialist support to students on non-traditional courses. In most colleges, support is offered to students by college counsellors. This support is of a general nature and is not specific enough or specialised enough to deal with the problems that female students may be faced with, such as attitude and acceptance by their colleagues who will most likely be male. Throughout the five years that I have conducted this research I have only come across two schemes where specialist support has been offered. Both of these schemes are in EU countries - one in Holland, the other in Denmark.

The Dutch and Danish initiatives carried out by Van der Craats (1992, p 27) and Valbjorn (1992, pp17-47) clearly illustrate the necessity of support to counteract the negative effects of social attitude and acceptance so that the playing field for girls in a male-dominated career can be made level. From the research carried out by Van der Craats & Bloeme in Holland (1992) and Valbjorn & Hansen in Denmark (1992), it is clear that three levels of support are provided:

1. Parental support - encouragement and involvement.
2. Educational support - non-discriminatory guidance and advice from teachers and careers advisers.
3. Employer support - providing opportunities for on the job training and future employment.

The Danes have successfully attained support from two levels: parental and educational. However, they have failed to provide the third level of support, ie employer support. The result of this failure is that, despite increasing the recruitment rate of female students, they are still experiencing a large drop-out rate.

The Dutch have provided the third level of support omitted by the Danes (employer support), but they have not provided the other two levels (parental and educational support). (Methods of providing support adopted by both the Danes and the Dutch are outlined later in this chapter.) Like the Danes, they have increased recruitment of female students, but are still suffering from poor retention.

The Dutch and the Danes are the only two countries that have published through the IRIS network any report dealing with craft level training for women in non-traditional trades.

These reports were initiated by the 'Commission of the European Communities' and cover the developments carried out in Denmark and Holland from 1982 to 1992. Initially the Dutch project was to cover a six-year period, but this was extended to cover ten. This extension was brought about because of the problems encountered due to the small number of girls who had chosen a career in engineering. (This is a problem that has also been experienced in this research project.) Despite the problem of small numbers and the fact that both projects were carried out in different countries, their conclusions bear similarities with each other, and also compare positively with my own preliminary findings. Both projects recognise that there is a problem with retention but this recognition is limited to one or two sentences. However, it must be said that the Bloeme & Van der Craats project (p 27) not only recognises the problem, but also gives a reason why some female engineers leave prematurely. The reason given is that they experience the barrier of 'attitude and acceptance' on the workshop floor, which is in accordance with my own conclusion which will be discussed in more detail in the later case studies. An example of the 'attitude and acceptance' problem is given on page 30 of the Dutch project where a young Dutch female mechanic sums up the attitudinal barrier by saying "Not only the customers had to get used to me but also my colleagues, and me get used to them ... , but that phase is behind us now, although I still have the feeling that I should be at least as good as a boy" . From this interview it is clear that the 'attitude and acceptance' has to be gained not only from colleagues, but also from the customers. Similar findings have also been illustrated in the Valbjorn & Hansen project (p 46). They write: "The barriers for women who are in non-traditional training and are to be integrated not only in the training situation but also in the labour force are becoming more and more visible and therefore easier to diminish".

It is important to retain as many young female engineering students as possible to demonstrate that women can be successful in a male-dominated career. These successful women engineers will also act as role models for future engineers and will help to eradicate the barriers highlighted by various

authors such as Valbjorn & Hansen et al. What is more, an improved retention rate will become a perpetuating recruitment aid as mentioned previously in the section dealing with recruitment, and in the INNOVAM scheme which is covered later.

DANISH INITIATIVE

Since the early 1980s, Denmark has been running a well thought out programme of vocational guidance which consists of a country wide network of counsellors. This national programme is planned in two stages. The first stage is carried out in the Folkeskolen (municipal primary and lower secondary school) and Gymnasiet (grammar school). At these schools the programme aims to achieve equality in subject and vocational choices for all seven to tenth grade pupils. The second stage is carried out in the technical schools (EFG) and at the further and higher schools. The programme in each establishment, whether first or second stage is being co-ordinated by Radet for Uddannelsesog Erhvervsvejledning (Council for Training/Education and Vocational Guidance).

Folkeskolen & Gymnasiet

Guidance and counselling may include such things as:

- choosing subjects and routes for further education in vocational training;
- choosing vocational training and job;
- writing applications, etc.

This guidance will take up to 20-40 hours per year. The methods include:

- group counselling on training and labour market questions;
- practical work periods in companies;
- visits to companies and training institutions;
- guest teachers from the social partners, training institutions, universities, etc;
- individual counselling;
- parents' counselling.

Guidance and counselling is provided by various counsellors depending on where it is carried out, ie:

- education counsellors attached to Folkeskolen;
- student counsellors attached to Gymnasiet and educational centres, universities, etc;
- vocational guidance officers attached to the employment agency;
- counsellors at the vocational training institutions as technical schools, commercial schools;
- Local authorities responsible for the re-integration of unemployed youngsters.

From the beginning of the 1980s, high priority has been given to try to diversify the choices of subjects of further education and vocational training made by girls and young women. The objective of the counsellors is to make contact with the young before they establish an adult life and at a time when it will be possible to influence attitudes and change the fixed patterns in their choices of education, vocational training and family life. The counsellors are aiming to:

- encourage the interest of girls in education/training within the traditional men's fields by informing these girls of the educational/training potential within the traditional men's areas, ie the technical and craftsmanship trades.

To help achieve this objective the programme will strengthen the co-operation between counsellors, teachers, schools, the surrounding society, planners and politicians.

In co-operation with equality consultants of the employment agency and some devoted teachers, small clearly defined experiments are organised, having 'equality and vocational choice' on the agenda. By way of a theme day, an introduction, or something similar.

Over a number of years different institutions have established initiatives to:

- develop methods and tools to ensure equality within subject areas;
- integrate equality in planning and implementation of vocational guidance arrangements for different target groups.

These initiatives are supported and inspired by the fact that a multitude of different and parallel activities are implemented. The experiences and results gained are then passed on to the Ministry of Labour and the Ministry of Education who then prepare action plans. Because of an established favourable political attitude funds for these initiatives are allocated. Further support is given by 'Lo', the Danish Federation of Trade Unions and the 'DA', The Danish Employers' Confederation, who also prepare materials and run campaigns for women in men's trades.

The training of counsellors and teachers is aimed at:

- ensuring the subject 'equality a central position in the guidance of all the youngsters in Folkeskolen and Gymnasiet;
- equality as part of everyday life and not an issue to be discussed only on special occasions;
- furthering the equality work along with the development of the school and society.

Vocational guidance in Folkeskolen usually takes place over one or two weeks planned by counsellors, teacher, and equality consultants.

Girls and boys are confronted with their own attitudes and their traditional and gender related choices. They are also informed of new and non-traditional vocational opportunities that they may not previously have considered.

A typical model of vocational guidance within Folkeskolen would follow four steps; these steps are illustrated by Valbjorn & Hansen (1992) and are as follows:

Step 1: Preparation
Step 2: Choices
Step 3: The specific sequence
Step 4: Evaluation

Preparation

Exposing pupils' own sex role attitude through different methods as questionnaires, writing papers, poems, etc.

Choices

Holding parent/teacher meetings with the theme of 'choices of educational and vocational subjects viewed in the light of our sex role pattern'.

A list of vocational choices and wishes forms the basis of lectures on 'the influence of sex roles to the vocational choices of girls and boys' and on 'the sex discrimination of the labour'. Finally parents were given an orientation about the full programme on sex differences and equality, given to their children.

The Specific Sequence

A Exposing and working on sex roles and sex role attitudes of girls and boys. Grades are divided into groups, girls and boys being grouped separately. Groups were to work on these themes:

- Gender differences at home (sharing the practical work, the social obligations, spare time activities).
- Gender differences in leisure time activities (what do girls and boys do, and why?).
- Gender differences registered through observation (who says something, what do girls/boys do, how much do they say, whom do they address, why?).

The group work is then put before all those involved by way of text and drawings/pictures on plates suspended in the classroom.

B Practical work in non-traditional occupations. Organised in a way that girls tried our simple craftsmanship work, and the boys took part in nursing and caring activities. (This is similar to the 'Try a Trade' carried out by the Dorset Careers 1989/90 project.)

- Others have planned visits for the girls to the technical schools and for the boys to visit commercial schools, a college of kindergarten teacher or similar.

C Discussions with women and men in non-traditional working areas. The pupils are visited by guest teachers who have made a non-traditional choice. The potential is virtually unlimited - a female carpenter and a nurse. Prior to the visit, pupils prepared questions both on the actual subjects/trades, on the choice, on the reactions of friends, relatives, colleagues, etc.

Evaluation

The sequence is evaluated in the classes involved. Results are passed on to others:

- The pupils exhibit paintings and posters, perform role-playing, etc.
- The pupils are interviewed for local radio broadcasts and newspapers.
- Teachers pass on experience gained to their fellow teachers.
- Planners describe the sequence and the results in reports, in periodicals, and similar.

In Gymnasiet the pupils are more academically gifted so the vocational guidance model is designed to recognise this fact and differs slightly from that of the Folkeskolen. Again Valbjorn & Hansen (1992) illustrate a typical model used in Gymnasiet over a period of between three and six days.

Your Everyday Life Within 15 Years

As a prelude, the students are asked to write down their expectations of their everyday life in the next 15 years, including their wishes for their vocational situation and their family situation.

Strong and Weak Aspects of Women's and Men's Characteristic Qualifications

The students are asked to review certain films which are decided upon by their teachers and counsellors and then asked to discuss the background of films and materials of differences of women and men, and what that means to the choice of jobs. The students are then asked to change roles. Working, through role-playing they learn to learn to understand and really perceive the situation of the opposite sex.

- Visits to Non-traditional Types of Training
- Evaluation as with Folkeskolen
- Follow-up

The sequence constitutes the prelude to a full programme of vocational guidance. Once a year, all Gymnasiet are visited by representatives (students) of further education/training institutions. On this occasion, you may look for information on the content, structure, employment possibilities, etc, of all the studies.

The preparation through the equality sequence gives girls the personal strength and background to seek information on a wider spectrum of training/education. A strategy supported by the fact that several educational institutions also want to break the distorted distribution by sex in certain studies.

Thus, they make an effort to send representatives of the under-represented sex, such as female engineers and females maths students.

Practical Training at a Work Site

All Folkeskolen in Denmark offer to the 8th, 9th and 10th grades the opportunity of practical training for periods of one or two weeks at a work site, the idea being that:

- The pupils should be given first hand experience of life at a work site.
- The pupils become acquainted with the wanted trade.
- The pupils become acquainted with an area non-traditional for their particular sex.

This practical training is conducted in various ways depending on the interests of pupils, parents and teachers. Valbjorn & Hansen (1992, pp 27-29) have illustrated three models used in practical training.

Model 1 Ideal practical training. Everyone is given practical training according to their top priority wish.

Model 2 Reverse practical training. All girls and boys are given practical training in a non-traditional area.

Model 3 Controlled practical training. All pupils are given practical training in women dominated trades once a year and the next year in the men dominated fields.

The appropriate model to follow by a pupil is determined in open discussions between school counsellors, teachers and parents. One model can be used one year, another the next. I personally feel that employers should also be part of this discussion as the employer is being asked to give his/her time to show a pupil the works of work.

In co-operation with teachers at the Technical and Folkeskolen schools, information days are held for girls in the fields of the engineering and building and construction industries. The girls will:

- meet girls (role models) who have already chosen a career in a non-traditional trade;
- become acquainted with a training environment which is unknown to them.

The girls who are likely to follow this programme are those who are in the final grades of Folkeskolen and Gymnasiet.

The programme's main points are that:

(a) introduction by skilled female workers on their personal reasons for making a non-traditional choice and on their experience with the choice in the workplace (unofficial adviser);

(b) introduction on the narrow choice of training/education of girls and boys and their future employment opportunities:

- Group discussions and work;
- Panel talks with representatives of the trade and industry and the social partners, craftsmanship women, as well as equality consultants.

This model is used additionally as a strategy to influence vocational choices. It is an offer to girls, who are already interested or who are considering a career in a non-traditional trade. The decision is taken between the school counsellor and the girls.

In connection with the introduction days, material will be prepared to be used in the follow-up stage back in the classrooms.

Girls and Boys Taught Separately

During the 1980s, a considerable number of classroom studies were made throwing light upon the different behaviours of girls and boys and their roles, in various subjects and in the teaching in general. On the strength of these studies, experimental teaching was established in several places with segregated classes of girls and boys.

The aims were to:

- enhance the awareness of girls that their choice of subjects in the 8th, 9th and 10th grades would prove significant to their future vocational opportunities.

- These segregated classes were established for defined periods and in selected subjects. The focus has particularly been on mathematics, physics, computing and Danish. Their purpose was to create more 'space' for the girls at vulnerable stages of their development - developing a learning environment and some educational methods meeting the needs of the girls and enhancing the interest taken by girls in the sciences.

Integration of Counsellors' and Teachers' Training

It is not easy to convert the interest in working on equality to specific and concrete teaching and everyday life. Teachers need new and wider qualifications, not necessarily learned in the established training/education. The objective of integrating the equality problem complex in the teachers' training is that of spreading knowledge, experience, methods and materials for all potential initiators of equality activities.

This is achieved in two stages:

Stage 1

- Holding conferences.
- Having days for discussing and trying out pedagogical methods.
- Establishing workshops and study groups.
- Practical training of teachers.
- Establishing a network of female teachers.

Stage 2

- Integration of equality in education/training of teachers and counsellors.
- Issuing equality material to use in the guidance and in the lower grades of Folkeskolen.
- An appointed working group will currently observe that equality aspects are not made invisible in the process of integration in the teachers' training.

VALBJORN & HANSEN - RESULTS AND CONCLUSIONS

Valbjorn & Hansen (1992, pp 46-47) summarise the barriers that they themselves have established within training institutions:

(a) General cultural differences in the expectations of young women and men, their abilities and their choices of vocation.

(b) Lack of female role models in non-traditional trades.

(c) Negative expectations from trainers and male students towards young women's ability.

(d) The loneliness and the visibility for young women in unfamiliar surroundings.

(e) Lack of pedagogical methods which take into account the socialisation of young women and their lack of technical and manual skills.

(Valbjorn & Hansen 1992)

The Danes findings are very similar to these conclusions as are my own preliminary findings. However, my findings do not fully concur with either project when it comes to (e) above which highlights the lack of either technical or manual skills. In all the interviews and observations that I have carried out during the first four years of my research project, there has never been an occasion where a female student being interviewed or observed has demonstrated a noticeable lack of ability in either knowledge or manual skill. In point of fact, these young female engineers were without exception committed fully to both their work and study. When it came to workshop practice, the female engineers on many occasions were able to give assistance to their male colleagues and vice versa. Therefore, these female students were no worse, and in most cases demonstrated a high level of

ability compared to their male counterparts. The reason why British female engineering students do not demonstrate such a lack of ability when compared with their counterparts in Denmark may be due to the different way in which the courses are structured. In Denmark their courses are still biased towards theoretical classroom work with few practical sessions, whilst in Britain the City & Guilds 383 Motor Vehicle Craft course and the new NVQ (City & Guilds 3300) course are heavily biased towards practical tasks with supportive or background theoretical knowledge (Appendix 2). This possible explanation is supported by a suggestion in the Dutch project of how to eradicate some inequalities of training. Bloeme & Van der Craats (1992, p 19) write: " ... important in realising equal participation of girls in technical education, in particular is the provision of additional tasks as an instrument for the development of equal opportunities for women and girls". These additional task units are specifically designed and aimed at young female engineers who are in their first year of traditionally male-dominated courses. These tasks are being used to help female engineers to gain a mechanical understanding or, as Bloeme & Van der Craats put it (p 19): "What boys learn through childs' play must now be imparted to girls". These additional tasks should also go some way towards eradicating the negative expectations expressed in Valbjorn & Hansens' summarised list of barriers (1992, pp 46-47), provided the levels of tasks are not too low or too far advanced for the student's ability. As for the British course design, both male and female students on the craft courses are assumed to have little or no knowledge so they all start off with basic, simple tasks which they complete at their own pace. From my own observations the female students start slowly but gradually speed up, overtaking many of the male students, and are soon producing work of a high standard. A typical self-perception of a young male student has high self-esteem. Abraham & Shanley (1992, p 98) cite work carried out by Simon & Feather (1973) and Dweck & Light (1980), who produced evidence to show that men tend to attribute their failures to external factors, whereas women tend to attribute them to internal, stable factors. These male factors, coupled with immaturity, will cause a young man to rush into a problem with little thought, whilst a young woman will think carefully before tackling the problem.

YOUNG WOMEN IN NON-TRADITIONAL VOCATIONAL TRAINING

There are approximately 230 different types of vocational courses in Denmark. These courses are grouped in eight main vocational areas.

- Metal industries
- Building and construction
- Land transport
- Agriculture
- Graphics
- Trade and office
- Food, household
- Services

With the exception of trade and office courses which are taught at commercial schools, the other seven are studied within technical schools.

In Denmark there are two routes to becoming a skilled worker. The Danes still take the view that irrespective of which route is taken, the apprentice will serve some of their time with a skilled tradesman or woman and on completion of their apprenticeship, they will have to sit an apprenticeship test.

First Route (Employed status)

The standard basic training at apprentice level begins with a one year basic training full time programme at a technical school. The apprentice will then carry on their practical training within their companies. The standardised basic training at apprenticeship level is finished by issuing a training certificate, after passing both the practical and theory test at their place of work and technical school.

Second Route (Full time training)

The second route of apprentice training is where the apprentice stays on a full time course at the technical school and only goes out on work experience. There is not much difference between either of these two schemes. In both types of training the apprentices will move between working at a company and staying at school. The only major difference between the two routes is the amount of time spent at either establishment.

No matter which route is chosen, after the basic apprenticeship training, further advanced training can be gained at the training schools.

In conjunction with the initiatives being made in the Folkeskolen and Gymnasiet, vocational training schools are also putting into effect other initiatives.

The specific objectives of these initiatives are to:

- motivate girls into choosing a career in male-dominated trades;
- strengthen the girls' identity and retain them in their training;
- integrate the girls at the technical schools, ie influencing the environment and allowing the teachers to develop the educational methods of their teaching so as to meet the needs of the girls;
- exchange experience on the barriers for girls in men's trades;
- tab establish a wide co-operation between pupils, teachers, counsellors, companies and industrial organisations.

Those girls who have been targeted for these initiatives are:

- the girls taking an interest in craft level training;
- teachers and counsellors at the centre of educational training;
- parents;

- planners and politicians;
- companies and industrial organisations.

In essence, all those who have a large influence on the career choice and training of young female students. The initiatives that the vocational technical schools have implemented take the form of three distinct events which are highlighted by Valbjorn & Hansen (1992) as follows:

Event 1 - Mobilisation of Girls

The idea is to get girls to choose traditional male-dominated trades so a wide co-operation is established in several places between teachers and counsellors in the Folkeskolen and at technical schools, as well as equality consultants within the employment agencies. These actions are aimed at:

- giving girls the best employment potential possible;
- making the educational environment familiar to the girls and vice versa;
- creating a debate and making existing barriers visible.

Event 2 - Keeping the Girls At It

Over a number of years, many experiments have been established with a view to:

- easing the experiences of girls on induction at technical school;
- strengthening the vocational identity and solidarity of the girls;
- preventing the high drop-out rate of girls;
- strengthening and developing a woman-friendly pedagogical approach;
- investigating the barriers which the girls are up against.

The initiatives are supported and inspired by the fact that:

- partners, eg employment agencies, equality counsellors, vocational training institutions, and local authorities have all co-operated with the establishments of these initiatives;
- ministerial action plans have been prepared and necessary funds for the initiatives have been allocated;
- a network of project managers has also been established;
- a favourable political attitude has been promoted.

The Danish Federation of Trade Unions and Danish Employers' Confederation are also engaged in recruiting and promoting more women into male-dominated careers.

Event 3 - Opportunities for Apprenticeships/Practical Training

In continuation with the basic year it is problematic in finding practical training places and future permanent jobs for the girls. Intensified efforts are being made towards employers with a view to (see summary):

- informing prospective employers about the qualifications of girls;
- allowing girls to complete their training/education and then obtain a job later;
- spreading the experience of employers of girls in male-dominated areas.

The vocational/technical schools are attempting to achieve these three steps by following a well thought out sequence of activities which are conducted over a five to ten week induction period. In the first instance the school will hold an information meeting for girls. Teachers and the substance of the trades are introduced. Counsellors and the equality consultants organise individual counselling sessions in order to clarify the choice and motivation of the girls who are asked to answer questions, discuss their views and perceptions concerning their career choice and associated problems. During and continuing after the initial induction period, the teaching of technical subjects is carried out within the chosen area, such as engineering and construction. During the entire sequence, general subjects and student guidance are included where the students will evaluate workshop training and attitudes and propose any changes necessary to combat any barriers that they may have encountered.

Early in the induction period a group will be established: 'Women in Men's Trades' (WIMT). This group is an initiative of the equality consultants. The reasons why the WIMT group is established is so that it will allow the girls in the non-traditional subjects and trades the opportunity of support.

The WIMT Activities

The WIMT group activities are divided into areas of internal and external activities.

Internal activities are:

- where groups meet once a month within the school to exchange experiences, discuss problems, and support each other.

External activities are:

- contacting and supporting students in their basic year;
- acting as guest teachers and constituting role models;
- making introductions to employers, trade unions and other important organisations;
- contacting the press for publicity;
- preparing information materials;
- holding a national seminar on women in men's trades for everyone working on the subject.

Apart from the initiatives previously mentioned, the vocational technical schools also offer segregated classes for those girls who may feel intimidated in a mixed group. This segregated group initiative is only for the first six months of the basic year and is aimed primarily towards girls who are taking up training in engineering and construction. However, not all girls want or need this extra provision and prefer to be in mixed groups from the very start.

For those girls who have decided to take advantage of segregated groups, they will be taught together in all subjects for the first six months. They will then, either in pairs or as a small group, join the mixed groups. Whenever possible, the girls will continue having a general subject, ie social studies, together as a segregated group. They will, if at all possible, be taught general subjects by the same female teacher throughout the year.

As part of their training the girls are placed with an employer. The employers' organisations are making a great effort to find practical training places for all the girls in collaboration with counsellors, teachers and representatives of the employers' organisations by meeting the representatives of local companies which have not previously employed girls within their organisations. These meetings usually take place after normal working hours and are aimed at personnel in charge of recruitment and colleagues who are involved with the training of new staff. After these initial meetings the company is then visited by the students, and employers are then invited into the school as guest speakers. It is, however, becoming increasingly difficult to find sufficient work placements for the girls to gain the necessary work experience.

WHAT LEVEL OF SUPPORT IS NECESSARY?

As mentioned previously, the factor that is missing from training schemes is support - educational, parental and employer.

Educational Support

From Valbjorn & Hansens' report and after various telephone conversations with several Danish training agencies, it is clear that a great deal of effort and planning has been put into action to ensure that all staff such as counsellors, trainers, teachers, advisers, etc, who are involved with either advising training or supporting female students, all undergo intensive training. This training is primarily aimed at ensuring that equality is achieved in all aspects of training from day to day living to equality in subject areas, materials, teaching methods and techniques. Support for these initiatives not only comes from trainers and to some small extent employers, but more importantly from a favourable political attitude which manifests itself in the manner of ministerial action plans and necessary funds for the initiatives that are being undertaken within the various educational institutions. In this aspect of recruiting more girls into male-dominated trades, the initiatives have been successful, but as to the problem of retention, there has been very little improvement.

Parental Support

Again, from the report, it is evident that parents of girls who are in the process of, or have already chosen a career in a non-traditional trade, are made aware through debates, counselling, and parent/teacher meetings, such things as sex differences, equality and choices of educational and vocational subjects. In this way, parents are made aware exactly what is involved in the training, job prospects and, in my opinion the most important of all, the barriers that face girls when they choose a career in a male-dominated trade. They are also informed of the necessary support to help overcome these barriers, and where to obtain this support when required. So, in the case of girls entering engineering, they will have at home the support of well informed parents and educational support and counselling at their various schools.

Parental support is a documented topic which many researchers have covered extensively. Looking at the levels of support and whether parental income, status, middle or working class culture, has any effect on the student's attainment whilst at school. However, it must be stressed that their findings are based on research which has been carried out in schools (in the pre-16 age group). Schools, by their very nature, are viewed as middle class establishments, using middle class culture and language which favour middle class pupils who are more likely to achieve at a higher level than a working class pupil. Conversely, a college of further education, teaching vocational subjects, is unique in its setup and is capable of cutting across the social barriers of language and culture associated with either working or middle class students. A vocational subject, such as engineering, by its very nature would be viewed as a working class occupation. Lecturers teaching these subjects will have started their careers in working class occupations and then progressed to lecturing - a middle class career. Colleges therefore provide a non-biased educational system.

The effects of parental support on students who are older and are enrolled on vocational courses at colleges of further education will be discussed later in this research.

Employer Support

Valbjorn & Hansen (1992, p 34) write concerning employers and trade unions that both the Danish Employers Confederation and the Danish Federation of Trade Unions find it difficult to evaluate the exact impact of their effort on the vocational choices of pupils, but they feel that it is important for them to continue. So why, when viewed from the educational and political points of view, are the initiatives operating in training schools successful in recruiting more girls into the craft trades, with the exception of engineering? Engineering has proved to be one of the more difficult trades for a girl to enter, but even here there have been some steps forward. However, when these same initiatives are viewed from the employers' perception, the picture is not as bright. To put this into perspective, it is essential that a clear understanding is gained of the very wide diversity of garages that are in existence in the UK and Denmark.

A TYPICAL GARAGE

To illustrate the wide diversity of garages and their operation and administration, using my own personal experience and knowledge of the engineering and motor vehicle trades (a career spanning 27 years from craft apprentice to workshop manager, and finally college lecturer), I considered what types of garages and engineering firms would be represented by the Employers' Confederation and the Federation of Trade Unions. By making several telephone calls to various training agencies, Trade Union and Employer Confederation representatives, plus a conversation with a Danish colleague, I established that garages in Denmark are set up and operate on a similar basis as those in the UK. For instance the popular soap operas currently running on British television represent common perceptions of a typical small garage (Kevin Webster of Coronation Street and Phil Mitchell of Eastenders who epitomise the general view of the majority of UK garages where there could be between one and five people employed in a small 'back street' garage). A large majority of these garages are at this moment in time struggling to stay profitable as they are usually small and independent and have no franchising agreement with any motor manufacturer. This means that many owners of these small garages have to work late into the night to ensure a reasonable living can be made. Their main income is from servicing and repairing any make and type of motor vehicle which comes into their workshops. The working conditions of many of these garages, although varying widely, can be described as being cold, untidy rather than dirty, wet (because the roof leaks), equipped with power points which are broken and damages, and smelly (due to exhaust gases, fuel and oil). In general, the majority of garages in the UK fit somewhere within this description. Opposed to this view is the picture of, say, a Mercedes main agency garage where the mechanics wear white overalls, work in an air-conditioned workshop which has tiled floors, painted walls and is clean. Staff are employed solely to keep the workshop clean and spotless. Every six months the mechanics are given a medical inspection by a doctor who will visit them in their workplace.

As it would seem that the garages in the UK are comparatively similar to those in Denmark, my next questions were as follows:

(a) How many garages in Denmark would be represented by organisations such as the Employers' Confederation or the Federation of Trade Unions?

(b) How many garages would be willing to take part in any of the initiatives being started in Denmark?

In both countries the majority of garages are small and independent and therefore are not represented by either organisation. For reasons such as pressure of work, or facilities that may not meet the required standards, these small garages may not take part in the training initiatives. In some cases, there may just be an unwillingness on the part of the owners to take part.

It will only be the franchised garages or main agencies that are represented by these organisations. It is also only these garages where the workload is more evenly spread and standards of facilities are

superior, which are able to take part in the training activities. Again, these facts were confirmed during various telephone calls to Denmark.

Although there is a high level of commitment to the initiatives from teachers, counsellors, politicians, and possible owners of large garages, there is little or no input or commitment from the smaller independent garages which undoubtedly far outnumber the larger garages. It is for this reason I feel that this is an important area which needs to be drastically reviewed if the Danes' initiatives are to become completely successful. In fact, Valbjorn & Hansen indicate this very problem when they state that it is becoming increasingly difficult to find suitable work experience places for the pupils to go to. The lack of employer interest was also mentioned previously in the 1991 IRIS bulletin and as yet this state of affairs has not yet been improved.

LACK OF COMMITMENT

Reinforcement of the problem of total commitment from garages comes from Bloeme & Van der Craats (1992, p 29), Valbjorn & Hansen (1992, pp 33-34), and from my own experiences of trying to place students, particularly female students, into local garages. During employer advisory committee meetings which are held regularly at Weymouth College, owners and managers of local garages have voiced their support for the college's schemes of placing students, both male and female, into local garages for work experience, but as in the case of the Danish organisations, it is only the larger garages who are represented at these meetings, and it is only the owners and directors who attend. Workshop personnel and owners from smaller garages are not usually represented. When, however, it comes to actually placing a student, particularly a female, into a workshop, it is the workshop manager or foreman who will have the final say, and more often than not they will find reasons why they cannot accept a student on work placement. The usual excuse used is that it doesn't matter whether it is a male or female student, they cannot accept them as they have not sufficient work to keep them busy. However, this is not usually corroborated by other workshop staff who are known at the college who state that they are actually 'pulled out' at work. In other words, they have more work than they can cope with. This has happened on quite a number of occasions, so as I suspect in Denmark, there is commitment from owners of larger garages, but where it matters the most at workshop level, there is little or none. So whether the garage is large or small, there is undoubtedly little or no commitment at the workshop levels, resulting in an almost impossible barrier of attitude and acceptance to be overcome.

How can this problem of lack of total employer commitment be eradicated? A possible answer, or at least part answer, may be found in the report written by Bloeme & Van der Craats. However, I must state that I have not been able to confirm any of this report despite carrying out an extensive search to try and contact the authors of this report. This search has included telephone calls, faxes and letters to the EU Commission offices in London and Brussels, and with personal contacts employed in various training and EU organisations in Holland, Denmark and Belgium, all to no avail. A comment made by one such contact would seem to sum up what has happened: "They have picked up their office and walked". However, despite this minor irritation, one of the suggested ways of placing students into garages was not to go to the owners who no doubt are male, but instead approach their wives. The

wives were asked to form a placement committee whose brief was to place female students into garages and then to liaise between the training institutions and placement providers. The wives, in conjunction with trained counsellors, were also asked to give support and advice before and during the first basic year at the schools and training colleges, and later when the girls started to apply for full time employment.

This radical and unique approach of gaining work placements, liaising between employer and trainer, and being available to give advice and support, also allows all garages whether large or small to be represented by the owners' wives who will also be instrumental in helping to plan and mould future training schemes. From my own experiences, I can confidently say that 99.9% of garage owners would be represented in this scheme and I also can vouch for the power that employers' wives wield as individuals, so when it comes to an organised group they would become a formidable force to be reckoned with. This approach I feel is the way ahead and should be explored fully with the view of actually implementing it in any non-traditional training. As I see it, the third level of support would then be put into place and this support would help the girls over the transitional period from being sheltered within educational establishments such as training colleges or schools, into the generally non-supportive and aggressive atmosphere in male-dominated trades.

As an off the cuff experiment I contacted several garage owners and their wives who I know personally. These garages are located in various towns around the UK and range from 'back street' garages to large independent and main dealerships. I put to the wives the idea of them being part of a liaison committee whose role would be to provide, and when necessary, find work placements for male and female students and to offer support and advice to girls who wished to become motor vehicle mechanics. It would simply be a scheme similar to that currently being piloted in Holland. All thought it was a novel idea and only one felt she could not take part as she was in full time employment and could not put the necessary time into the scheme. However, she did say that if such a scheme was to be put into action she would give it moral support and do what she could to ensure the girls were given every opportunity to become mechanics. All the other wives who were either employed within the garages as book-keepers, receptionists, etc, or had some unofficial floating job where they did odd jobs when necessary, said that they would be willing to help. So it would seem that there is an untapped support within industry itself which the Dutch seem to have identified and are using. However, as I said earlier, despite extensive research, I have not been able to contact and carry out further research into this report.

The Dutch report does mention one training organisation, INNOVAM, which I have been able to contact, but this organisation is only a small independent training group which although partially funded by the Dutch government, obtains most of its income from running INNOVAM as a business.

INNOVAM

INNOVAM is an integrated organisation which was originally two separate organisations. One organisation was supported on a semi-governmental basis whilst the other was supported by private industry. On 1 January 1990, these two separate organisations were incorporated under the title of INNOVAM and are now funded in four ways:

1. By the Secretary of Education and Science;
2. By the Secretary of Social Affairs and Employment;
3. By Social Partners (private industry);
4. By income from selling training.

To encourage garages to take on female trainees, garages were given an extra subsidy. For example, the cost of initial training is approximately 10,000 Belgian francs per year. The subsidy consists of 2,000 francs for male trainees and an extra 1,000 francs for female trainees.

In all, it has taken three years to get the garages acquainted with the idea of having girls in the workshop. INNOVAM themselves pointed out that the expected problems of mixing males and females in a workshop did not occur. However, they did have some difficulties in some individual cases, and for this reason INNOVAM employs female consultants who help both the female trainees and the employers. These female consultants visit the garage once every six to eight weeks. This is in addition to the female trainees studying at college where they have access to the consultants if and when necessary.

INNOVAM have also used garage owners' wives as placement officers and providers but this work is not carried out in conjunction with any training school, therefore, it has not been used extensively throughout Holland. INNOVAM does, however, claim that this approach has been successful and has led to there being sufficient work placements for the girls to choose from. What is more, they are accepted more easily and speedily by the placement personnel. In fact, if the report carried out by Bloeme & Van Der Craats is correct, the problems do not lie with industry as in the case of the Danes, but in schools and training colleges. The authors of the Dutch report state that it appears that too much attention is being given to the development of programmes which has the result that the goal of equal participation of girls in all types of education is being pushed to the background. Furthermore, many of the teachers specifically responsible for emancipatory projects find themselves in an isolated position with the organisations. Broadening the basis of support of emancipatory activities is lacking which is leading to the threat that some projects and their results may be vanishing, particularly if there is no structural change in the organisation of education.

WHAT ABOUT BRITISH EFFORTS?

At the beginning of this section I reviewed the only two reports to be published dealing with non-traditional craft training. Both of these reports concern training in two European countries. What of the British efforts to try and solve the problem of retention?

In the UK there has been little or no research of any significance has been carried out to try and establish why the problem of poor retention exists. There has been some fragmented research by various organisations which include the YWCA, Ilkley and Bradford Community College and Willesden College. Researchers such as Tizzard of Huddersfield Polytechnic have also carried out tentative research to identify the problems experienced by young women in male-dominated courses. I shall now highlight these organisations and their efforts.

YWCA

The YWCA published a report in 1987 which dealt with the many problems that girls face when they are entering a non-traditional career.

This YWCA report was initiated in the first instance as a result of a training officer's concern about the lack of female craft apprentices. A small scale research was started to investigate the social and emotional experiences of girls in male jobs. It was also envisaged that during the research they would establish some short residential courses where female apprentices could meet each other and talk through areas of common interest (support group therapy). However, it soon became apparent that this initial research only scratched the surface of the problem, so it was decided to carry out a more detailed study to establish the experiences facing girls in male jobs. The research was carried out between the periods October 1982 to September 1985. The areas covered were in construction, engineering and the printing industries, and several girls from each discipline were interviewed, either individually or within groups. The questions covered were based on their experiences from when they first sought advice on their chosen career at school, to their first days at work or college. From this the YWCA how run residential courses lasting between three and five days where young women are given advice and assistance when they are considering a career in engineering.

Bradford and Ilkley Community College

The Bradford and Ilkley Community College, runs an all-women returners' motor vehicle course for the City & Guilds 383 Levels 1 and 2. The course is partially funded by the European Social Fund (ESF) which means that it has to provide certain facilities and meet certain criteria, such as being aimed at a group within a depressed area where unemployment is high, provide adequate chrèche facilities, etc. At present the two female motor vehicle lecturers who are responsible for organising this course are in the process of writing a report on the effectiveness of the course and its impact on the career prospects of women motor vehicle mechanics (Appendix 2c).

Willesden College

Walsh and Hooker, two lecturers at Willesden College, are currently working to identify the problems experienced by young women on male-dominated courses with a view to initiating positive plans of action to encourage women to persevere with their training. Tizzard (1990) has also carried out a small scale research into the problems experienced by young women. However, both these research programmes have failed to follow the issue through to establish the reasons why so many female

students fail to complete their courses and abandon the idea of engineering as a career altogether. As a result of their research, Willesden College are currently experimenting with segregated classes for women with a view to establishing the effect of all-women groups in offering help, support and encouragement to each other.

The advantages of establishing segregated groups have been identified in several separate research projects, two of which were carried out by Sharpe (1976) and Shaw (1976) and a third by Spender (1982). Each of these studies reports that girls tend not to do their best in a mixed class as there appears to be some behavioural deterrent which inhibits them from competing with their fellow male students, thus restricting their effort and preventing them from reaching their full potential. Sharpe's summary of this syndrome (p 136) was 'if you want to attract boys, don't start by showing how clever you are'. Spender does concede that: "Beyond education the sexes will mix freely". Whether this means that they will mix freely in colleges of further education will have to be answered. On the question of the sexes mixing, many of the girls interviewed took the view that they would have to work with men in the garages or workshops, so they might as well start as they meant to go on and therefore mix from the very beginning. This view was also shared by girls who had been interviewed in Holland and Denmark.

From both sections of this chapter the following observations can be made:

(a) In the case of recruitment there have been some inroads made; however these only relate to engineering at higher levels with no effort being made to recruit craft students.

(b) In the UK recruitment is being carried out in an ad hoc, fragmented way, with little or no joint action or liaison between organisations.

(c) Organisations are only concentrating purely on recruitment ignoring problems of retention; they should tackle the problem of retention. This obsession with recruitment I view as being like a colander mentality where no matter how carefully the rice is poured in, some will be lost through the holes. The holes of the educational training system need to be blocked to ensure that female students with high ability are retained.

(d) Once recruitment has taken place there is no support given by the recruitment organisations except those mentioned in Holland and Denmark.

(e) There is a marked lack of interest by employers in the UK and other EU member states.

(f) Employers, teachers, careers advisers and society as a whole, still feel and believe that women cannot become engineers or motor vehicle mechanics and will quote excuses which are covered in Chapter 1.

(g) Attitude and acceptance are the main barriers, and these barriers will only be removed once more young women become qualified engineers and are visible to the general public.

(h) Successful female engineers will then become recruitment aids for others who will use them as role models.

(i) It is imperative that the small number of young girls enrolling onto craft courses are given all necessary support to ensure that they successfully complete their course and obtain employment.

Denmark has no doubt made great inroads into eradicating the distorted distribution of girls employed in traditional male careers. The report compiled by Valbjorn & Hansen shows that although there has been a small growth of women entering the construction trades, a much larger number of women are entering other non-traditional trades such as graphics and agriculture. However, the engineering trade is still one career which is proving difficult for girls to enter, and of those girls who do, there is still a high drop-out rate. So why, despite all of these well thought out, well funded, and well supported schemes and initiatives, and despite increasing recruitment numbers, are they still suffering from poor retention? I attribute the failure of the Danes to retain more girls and stem the flow of female students failing to complete courses to the lack of full commitment from employers.

The Danes have solved the educational and parental support problems, whilst the Dutch have solved the employer/employment problem. A combination of each project may be the answer to the problem of recruitment and retention of girls in male-dominated trades particularly engineering. It is this hypothesis that I shall investigate with a view to eradicating the barriers of attitude and acceptance to girls entering non-traditional trades, particularly engineering. I intend to do is to establish that the lack of support is the root cause of poor retention and because of this problem it continues to perpetuate the barriers of attitude and acceptance.

Chapter 3

Chapter 3

INTRODUCTION

In Chapter 2, I reviewed the recruitment organisations and their initiatives in Britain and the EU. At present none of the initiatives have investigated fully the reasons why young women are leaving before they have completed their course. Although many reports agree that this is a problem that should be further explored, eg Tizzard (1990), as yet no comprehensive research in this area has been undertaken. Chapter 2 ended with a summary of problems associated with these initiatives leading to a conclusion that apart from the two initiatives being carried out in Holland and Denmark, there is no emphasis being placed on the recruitment of young women onto craft level courses or the problem of retention. (It should be noted that the Dutch initiative is co-ordinated by IRIS, which is the only European organisation solely concerned with craft level, and the Danish initiative is co-ordinated by PETRA[5].) IRIS and PETRA are only co-ordinators for projects and initiatives that are being put forward by various training agencies, eg INNOVAM, throughout the EU, so they do not have any direct contact with students, only having contact with training establishments (see p 57).

Of the EU schemes in existence many are aimed at the young women trainees entering the traditional options for young women in engineering, that of reception and the selling of parts and accessories within the parts department (see Appendix 3). So at present there are very few training initiatives for the training of female engineers and even less for female mechanics. The result of this is that very little literature and few in-depth research reports have been compiled concerning these areas of training. Those reports that have been produced have mainly dealt with the problems that young women face when they have enrolled onto engineering courses. These reports which include Tizzard (1990) in the UK, Bloeme and Van der Craats (1992) in the Netherlands, and Valbjorn & Hansen (1992) in Denmark. The findings of each of these reports are very similar in that the young women interviewed had suffered similar experiences, eg had the 'mickey' taken out of them by the male members of the group, and lack of acceptance by male peers. These findings have also been reinforced by my own initial 'pilot' questionnaires and interviews which will be discussed in the following chapter.

The hypothetical model on the following page shows positive and negative influences in the guise of barriers which a student is subjected to. The barriers are, in essence, society's attitude and acceptance of anyone who intends to seek training and employment in any non-traditional career. Society's attitude and acceptance can only be influenced positively by the student's successful outcome which includes self-esteem, which itself acts as an interim success leading to a student's motivation to remain on the course and successfully complete the course before becoming a skilled engineer. The more successes there are, the sooner the barrier presented by society will vanish. However, any unsuccessful outcome, whether it be failure to complete or failure to succeed, only goes to reinforce society's barriers. To prevent this negative reinforcement I have suggested that the student needs three pillars of support. These pillars consist of parental, educational and employer

5 PETRA now comes under the title 'Leonardo'.

support. If all three are in place then the problem of poor retention and failure is greatly reduced. If for any reason all three are not in place, then the probability of poor retention and failure is much increased, thereby again reinforcing the barrier. Although parental and educational support is recognised as being necessary for pupils in compulsory schooling (see p 43, Chapter 2) the importance of including employer support, particularly for students who are studying non-traditional subjects has not yet been fully explored. Without this employer support I suggest that the retention and success rate will remain low.

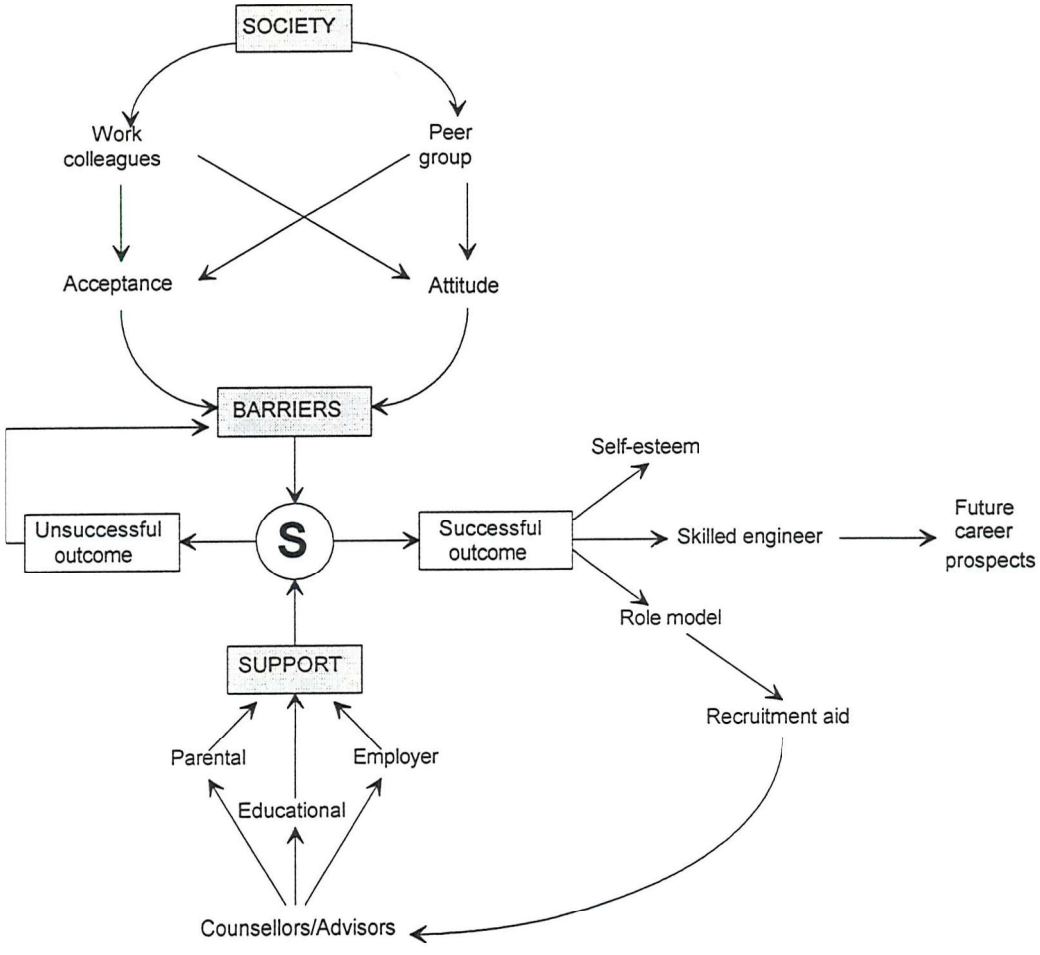


Figure 7

Hypothetical model of the influences affecting student retention/success

Before undertaking my initial pilot study, as with any research project it is vital that consideration be given to the kind of method that is appropriate for the research being undertaken and the ways in which different research techniques may be used alongside each other to present the data obtained in the most effective way. G Burgess (1985, p 3) quotes Zelditch (1962) who suggests that researchers need to ask themselves:

(1) what kinds of methods are relevant for the particular topic under investigation;

(2) what kinds of information are relevant;

(3) how the methods used can be evaluated.

Zelditch (1962, p 576) suggests that these questions be addressed by considering the 'efficiency' and 'informational adequacy' of particular methods in gathering data which Zelditch sums up in Table 13.

Information types	**Methods of obtaining information**		
	Enumeration's and samples	**Participant observation**	**Interviewing informants**
Frequency distributions	Prototype and best form	Usually inadequate and inefficient	Often, but not always, inadequate; if adequate it is efficient
Incidents, histories	Not adequate by itself; not efficient	Prototype and best form	Adequate with precautions, and efficient
Institutionalised norms and statistics	Adequate but inefficient	Adequate but inefficient, except for unverbalised norms	Most efficient and hence best form

Table 13
Types of information by methods of obtaining information
(Zelditch 1962)

Where Zelditch advocates using different research techniques alongside each other others like Sieber (1973, pp 1335-1359) claim that methods should not merely be used alongside each other but should be integrated in the course of a research project. Sieber indicates how qualitative and quantitative methods may be used together by providing a specific discussion of fieldwork and surveys. Filstead (1970, p 8) and others, however, have gone as far as to suggest that one method should be used to the exclusion of any other approach. Filstead himself who is a strong supporter of the qualitative method which Burgess (1985, p 2) highlights by quoting Filstead's own introduction to his volume on qualitative methodology.

"The assets of qualitative methodology in sociology need to be stressed and the shortcomings of quantitative methodology need to be exposed in their boldest relief."

Filstead (1970)

Writers such as Finch, Burgess, Jones et al, have all covered fairly extensively the merits and difficulties of using either method over the other. Finch (1986, p 5) quotes both Bryman (1984) and Halfpenny (1979) who have highlighted the concern that sociologies have about using these methods. Since the 1950s, there has been a debate amongst sociologists about the relative merits of both quantitative and qualitative approaches. It is as Bryman states: " ... a debate which has been conducted principally by the advocates of qualitative research, arguing against a dominant tradition which has accorded quantitative approaches a much higher status".

Finch goes on to say that within the dominant quantitative approach a polarity is established between the two approaches in which qualitative methods are seen as soft, subjective and speculative while quantitative methods are seen as being hard, objective and rigorous. Burgess (1985, p 1) also covers this polarity by listing the terms that Halfpenny recorded which were used by participants during a symposium concerned with the analysis of quantitative data.

Qualitative	Quantitative
Soft	Hard
Dry	Wet
Flexible/Fluid	Fixed
Grounded	Abstract
Descriptive/Exploratory	Explanatory
Pre-scientific	Scientific
Subjective	Objective
Inductive	Deductive
Speculative/Illustrative	Hypothesis testing
Political	Value Free
Non-rigorous	Rigorous
Idiographic	Nomothetic
Holistic	Atomistic
Interpretivist	Positivist
Exposes actor's meanings	Imposes Sociological Theory
Phenomenological	Empiricist/Behaviourist
Relativistic	Universalistic
Cast Study	Survey
Good	Bad
Bad	Good

Table 14
Comparison between qualitative and quantitative data analysis (Halfpenny 1979, p 79)

It is interesting to compare this list of terms used to compare the salient points of both quantitative and qualitative approaches with a similar list reproduced by Usher (1995, p 13) which was originally taken from Plumwood (1993). The list covers the key elements in the dualistic structure in western thought.

The list itself could easily be divided into masculine (patriarchal) and feminine (matriarchal) attributes.

Masculine	Feminine
Culture	Nature
Reason	Nature
Mind	Body (nature)
Master	Slave
Reason	Matter (physical)
Rationality	Animality
Reason	Emotion (nature)
Mind, spirit	Nature
Freedom	Necessity (nature)
Universal	Particular
Human	Nature (non-human)
Civilised	Primitive
Production	Reproduction (nature)
Public	Private
Subject	Object
Self	Other
Male	Female

Table 15
Comparison between masculine and feminine attributes (Plumwood 1993, p 13)

From both of these lists a close similarity can be seen which could possibly be why feminist research was originally seen to be closely allied with qualitative research methods. Indeed, feminist writers such as Oakley (1981) and Graham (1983) have both argued for the superiority of qualitative research methods in relation to feminism. Finch, however, makes the point that throughout the history of social research with its various approaches, there is no gender link in terms of research personnel. Usher (1995, p 13) quotes Morgan (1981) who points out that a 'macho' style of conducting a qualitative research can also be identified.

There are other research methodologies used, such as feminism, but this methodology is as Usher (1995, pp 21-22) states that: "At an earlier stage in the development of feminist theory it was argued that qualitative approaches were the hallmark of feminism because of their respect for the inclusion of women's experience which interpretative research methodologies advocate".

Later she goes on to move away from this comparison between qualitative and feminist research by saying that through work carried out by the feminist scholarship feminist theory now uses the full range of methods. So it could be argued that feminist theory is only following Sieber's suggestion that one method should not be used alongside another but be fully integrated into each other. So what is

quantitative and qualitative methodology and what are their merits? There have been many books, papers and journals written covering quantitative and qualitative research methods.

WHICH METHOD TO USE

An important issue in relation to the contrast between qualitative and quantitative research is raised by Finch (1986, p 8). She asks the question whether epistemological differences necessarily imply different research methods or techniques; and conversely, whether the use of a particular technique must inevitably mean that a particular epistemological position is adopted. Finch then points out that conventionally epistemology and method are inescapably entwined with one another. This view of natural entwining is not taken by all. For example, Bryman (1984, pp 75-92) argues that although epistemology and methods are often combined he questions whether this is a necessary alignment. In his journal he reviews the debates concerning quantitative and qualitative research methods. He puts forward that discussions concerning the distinction of both these research methods has led to confusion between epistemology and method/technique. Bryman argues that there is a definite distinction between the two. Positivist and phenomenological epistemologies are very different and resist attempts to accept them. Be that as it may, qualitative and quantitative methods are not clearly related to these. Bryman himself offers a reason as to why this confusion may arise. He puts it down to the different techniques which are used to symbolically represent different epistemological positions. Other writers such as Marsh (1982, p 98), Delamont and Atkinson (1980, p 110), Grimshaw, Hobson & Willis (1980, p 74), also point out the fact that there is no automatic and necessary alignment between techniques and epistemologies. Finch (1986, pp 7-10) covers these arguments more fully. She cites in depth the arguments put forward by these authors.

It is not important which technique is used provided the researcher identifies clearly what it is they are researching, the data required, and the audience they wish to present this data to.

Another important aspect which the researcher should also consider is who is the potential audience that the data is to be presented to. Both Burgess (1993, p 4) and Finch (1993, p 125) make this point concerning the appropriate research method for the potential audience. So the question that must be asked and answered by any researcher is 'which method or methods can best be used which will allow for formulating and presenting the gathered data in a way that will commend itself as relevant and important to the potential audience?'. For example, an engineer views data presented to them in black and white terms - 'it either goes or it doesn't', whilst a sociologist views things, not in black and white terms, but in terms of grey. An engineer, therefore, will readily accept quantitative data whilst the sociologist will more readily accept qualitative data.

In his book, Jones (1993, 112) begins Chapter 8 by portraying sociology as a subject of diverse theories with no theoretical orthodoxy and there are only competing ways of explaining the nature of the relationship between the individual and society. Browne (1994, p 395) sums up sociologists as having similar concerns to most people in society. However, what makes the views of sociologists different from those likely to be aired in such places as a public house, works canteen, or any place where social exchanges are voiced, is that sociologists need to provide evidence to back up what they

say. The evidence gained is collected from various sources and through the use of a number of research methods. Jones (1993, p 112) defines method and methodology as being: " ... different levels of knowledge acquisition, methodology refers to the knowledge **production** process while method refers to **specific** tools or knowledge acquisition". The tools, as Jones calls them, are the instruments/method used by the researcher to collect data necessary to support their claims.

QUALITATIVE RESEARCH METHODOLOGY

Finch (1985, p 5) quotes Bryman who takes the view that: "Qualitative research is looking not so much for 'causes' but for 'meaning' rejecting the natural science model and seeing the task of social research as uncovering the meaning of social events and processes based upon understanding the lived experience of human society from the actors 'point of view'." Finch also defines qualitative research as a technique which encompasses data that is not statistically based, and one which is suited to small scale analysis. In effect, the researcher tries to get to know the social world being studied at first hand by such means as:

(a) particular observation;

(b) in-depth interviewing, either by:

  (i) semi-structured interviews;
  (ii) unstructured interviews.

These activities are then supplemented where appropriate by documentary evidence. So by following these activities the researcher is as Finch et al say, trying to study social life in a natural setting. It is, therefore, fair to say that qualitative research is based heavily on the social interaction of the groups being studied or as Popkewitz (1981, p 156) and Burgess (1984, pp 2-3) put it: "Such techniques have their roots in social anthropology and, as in that discipline, the emphasis is upon studying social life in natural settings". Although qualitative research places a large emphasis on observation in the natural context, it is strange that a large proportion of qualitative data is gained through techniques such as interviewing which, as Measor (1985, 55) writes when dealing with the issue of analysing the context of the interview: "It is an artificially arranged set piece of interaction". Jones (1993, p 114) writes concerning research techniques: "The same research technique can be used for very different ends; what matters is not so much what a technique is **technically** capable of doing, but what particular task it is asked to do". Jones then gives a simple example of what he means. "After all, knowing what a knife can do - from balancing peas to cutting up food, to opening envelopes, to slitting throats, to making surgical incisions - doesn't tell us **what** it does on any particular occasion, unless we know the aim and intention of the user". He then goes on to look at the quality of the research technique used. "There is little inherent quality in a research tool; what matters is the uses to which the sociological researcher chooses to put it. To understand the use of data collection techniques, we have to understand the context in which they are employed; this context is often revealed by the understanding of the ontological and the epistemological interests of the researcher".

So why use qualitative research methods when they are based somewhat on contradictory ideals? Its strength must lie in the fact that the data gathered is not just a snap shot of what is happening. In fact, qualitative research puts 'colour' into the research data. As Finch (1986, p 113) says when listing the potential benefits of qualitative as opposed to quantitative research: "In providing the 'colour', qualitative studies reflect the subjective reality of the people being studied". To illustrate what is meant by the term 'lack of colour', Bryant and Jones (1995, p 1) give a suitable example when discussing the use of statistical data. They give the following comparisons of how similar data may be given, one with colour (qualitative) whilst the other is devoid of colour (quantitative).

Example A

Liverpool 2 Arsenal 1

Example B

In a close fought game, the home team eventually triumphed though the visitors had first taken the lead against the run of play.

It is clear that in the first example the data is precise and gives just the bare facts/values and nothing else. The second example does not give any precise values (or scores), but it does present the reader with a picture of what took place during the game.

The method of presenting data in a descriptive manner has been used for many years by people such as Booth (1902) and Mayhew (1851) who carried out a study of Londoners. His study was aimed at trying to raise awareness of a middle class audience who were blissfully unaware of the plight of the poor in London at that time. Mayhew used very descriptive data to get his message across. By portraying the data in this way, Mayhew established the social interaction of the poor at that time. Finch (1986, pp 78-83) covers in some depth Mayhew's work. She cites Mayhew who saw himself as a pioneer and described his work as: "The first attempt to publish the history of the people from the lips of the people themselves - giving a literal description of their labour, their earnings, their trials, their sufferings, in their own 'unvarnished' language". It is evident that Mayhew was trying to gain natural data, and data which showed the social interaction of the groups being studied. Bryman (1984, p 70) puts this social interaction as: " ... understanding the lived experience of human society from the actor's point of view".

In his work, Woods (1983, pp 1-16) also highlights the interactional aspect of qualitative research when studying 'sociology and the school'. Finch (1986, p 7) draws on Woods' work and writes concerning this work: "In relation to studies of schooling, this has meant that researchers have focused on the detail of how pupils and teachers interact with each other, how they experience each other, how they interpret the processes going on in the schools, and how they each organise their school activity".

One of the main strengths of the qualitative method is its flexibility to accommodate and capitalise upon any problems or unexpected data which may come to light during the study. Rist (1984, p 166) argued that: "Flexible research strategies are vital to capture events and persons which go their own

way, not as predicted in advance; research strategies which cannot do this are doomed to reflect only that which stood still long enough to be measured".

A hypothesis is tested through quantitative measurement at a single point in time (ie a snap-shot of a moment in time does not allow for any changes to be made). A qualitative method, however, allows for a continual involvement through a longitudinal study programme which follows the target groups and enables the researcher to establish hypotheses and not just test them. If necessary, direction can be changed to obtain more in depth data as argued by Rist.

The procedures adopted in qualitative research are characteristically inductive rather than deductive from the data gained by the use of the various techniques used in this type of research. These techniques include case studies, questionnaires, observation, interviews, where some or all of these techniques can be used to develop and not just test generalisations. Finch (1986, p 7) points out that: "It is at this epistemological level that the oppositional nature of qualitative research within social science has been most obvious". She then goes on to quote Cicourel's influential works (1964) in which he sets out not merely to demonstrate that there are different ways of knowing, but to establish that conventional sociological research based upon positivists epistemology (quantitative research) can never produce valid knowledge about the social world.

INTEGRATION OF METHODS

The use of detailed descriptive data obtained by qualitative research methods can make what could be a complex situation easier for the targeted audience to understand. This capacity of providing detailed descriptions is one of the strengths of qualitative research methods which is sadly under-used in the more traditional dominant methods of policy-related research. Finch (1986, p 162) quotes Shipman who argues when discussing the relationship of ethnographs to policy writes: "Producing good descriptive work can potentially be an important basis for practical action, since the policy-makers always lack details of what is actually happening and always make decisions without adequate information". James (1977, p 193) writing again on ethnography and policy within the USA also argues that great strength of descriptive data can provide: " ... perspective, insight and understandable situations".

Also by using qualitative and quantitative research methods it is possible to present evidence in a more convincing manner by using various methods for data collection. This multi-method approach will allow Denzin's concept of triangulation of data to be used to check the findings are true findings and are not corrupted in any way. Concerning the different kinds of evidence presented and therefore the purity of the findings, Rist (1984, p 164) points to the fact that qualitative data in policy-related research contains many different kinds of evidence, and then goes on to argue the point that this is an important aspect of qualitative research as: "It can often be used as a check on statistical findings, as statistical data can lead to mathematically correct but socially ludicrous conclusions".

Wax (1971, p 10) writes concerning the dangers of using research methods that are not flexible in their make-up. He warns: "Strict and rigid adherence to any method, technique or doctrinaire position may, for the fieldworker, become like confinement in a cage. If they are lucky or very cautious, a fieldworker may formulate a research problem so that they will find all the answers they need within their cage. But if they find themselves in a field situation where they are limited by a particular method, theory, or technique, they will do well to slip through the bars and try to find out what is really going on".

So clearly a researcher should not rigidly apply a method of investigation without considering all aspects involved. Instead they should be flexible in their research methods in order to utilise both quantitative and qualitative methods fully.

The attributes that qualitative methods can bring to any research projects are listed by Burgess (1986, pp 4-5). These attributes are, as Burgess says: " ... present to a greater or lesser degree in many qualitative projects".

1. The focus is on the observed present but the findings are contextualised within a social, cultural and historical framework.

2. The research is conducted within a theoretical framework. While there may only be a small number of questions to orientate a study, further questions may arise during the course of the investigation.

3. The research involves close, detailed intensive work. The researcher participates in the social situation under study.

4. The major research instrument is the researcher who attempts to obtain a participant's account of the social setting.

5. Unstructured or informal interviews in the form of extended conversations may complement the observational account.

6. Personal documents may give depth and background to the contemporary account.

7. Different methods of investigation may be used to complement qualitative methods with the result that different methodologies may be integrated by the researcher.

8. The decisions regarding the collection and analysis of data take place in the field and are products of the enquiry.

9. The researcher attempts to disturb the process of social life as little as possible.

10. The researcher has to consider the audience for whom they are producing a report and the main concerns to be included.

11. Research reports disseminate the knowledge which informants have provided without rendering harm to them, taking into account ethical problems that confront the researcher and the researched.

12. The researcher monitors the dissemination of materials and provides feedback to those who have been researched.

Burgess (1985)

So, it can not be too strongly stressed that on the issue of which method a researcher should adopt they must first consider all relevant areas which they have previously covered. However, they should also bear in mind what Burgess (1985, p 12) says when citing Barnes (1984): "That compromise is about all that remains for the researcher who utilises qualitative methods". Burgess then goes on to cover the areas where a researcher needs to work out compromises. These areas include:

(a) the role of theory in the research process;

(b) the relationship between theory, policy and practice;

(c) the relationship between data collection and data analysis;

(d) the question of dissemination and the ways in which research reports can be written for different audiences;

(e) the relationship between researcher and target group who may collaborate or be in partnership with each other.

Burgess (1985)

Whichever method(s) is(are) used, it should enable the audience to interpret events in the light of their meaning for participants of the study. It should also ensure that the data gained is valid and as near to the truth as possible.

Which Method?

Beishon, Virdee & Hagell (1995, pp 3-28) carried out a research project initiated by the Department of Health. The research comprised of two main parts. The first was a qualitative study of six case study nurse employers. The second part was a national postal survey of nursing staff. The research was intended to address five main aims, the first three of which related to the case studies and the other two to the postal survey. In broad terms, the purpose of the research was to provide the framework of fact and analysis for discussion about how best to meet the needs identified in the recruitment

procedure within the NHS. The case studies covered the general issue of personnel policy and practice within the NHS and investigated whether the existing procedures were such that they allowed fairness or could lead to discrimination. In general, personnel policy and practice should ensure that the best candidate for the job is selected and staff are sufficiently supported in their work in order to reduce the turnover rates and increase personnel development. The qualitative approach undertaken in this part of the research was particularly important in investigating aspects of the problem in more detail. In-depth qualitative research provided the material which concerned range policies, practices and experiences within the case study. No firm statistical conclusions were drawn from this work, but what the qualitative evidence gathered did provide was an understanding of the processes which quantitative methods could not (as mentioned in previous sections).

The postal survey collected career history information from a sample of over 14,000 nursing staff to complement the qualitative data collected in the case studies. This quantitative method was adopted to obtain the statistical data used in support of the data gained through the qualitative research method. This research technique complies with Sieber's suggestion (1973, pp 1335-1359) of using combined research methods.

As Beishon et al (1995, pp 3-4) research have close similarities to that of my own research in that recruitment and reduction in the turnover of staff are common to both projects, I used a similar technique.

The techniques used included:

(a) postal questionnaires;

(b) semi-structured interviews were taped and transcribed;

(c) case studies where a longitudinal study programme took place involving regular interviews of the target group;

(d) passive observation;

(e) discussions with persons who were in daily contact with the case study subjects, ie lecturers.

The data gained was analysed and, where appropriate, presented in a statistical format. The reason for combining the two methods was, as previously mentioned, to capture over a period of time a complete picture of the subtleties of student-lecturer, student-student, student-parent, and student-friend interactions. As to the actual survey being undertaken in this research, all of the techniques previously mentioned were used to their fullest potential in an attempt to achieve a complete picture. The data that was collected was handled carefully bearing in mind all the pitfalls that have been identified by authors such as Burgess (1985), Finch (1986), Oppenheim et al (1968), to ensure the validity of the findings.

INITIAL FRAMEWORK

By following the recommendations for the implementation of educational surveys outlined by various authors such as Cohen and Manion (1990, pp 244-267), a framework for the gathering of information necessary for this research project was formulated. The first task was to identify the population to be surveyed and make decisions about what information was to be gleaned from the research.

Problems Arising

The ideal target population was to be 16 to 19 year old female engineers who were currently undertaking a craft engineering level course in either light production or motor vehicle engineering. This was an idealistic aim which in the cold dawn of reality was not possible as there were not sufficient numbers of such people to formulate a valid hypothesis. It soon became apparent that there are very few female engineers who fitted the original criteria, so if a reasonable/representative return was to be achieved, then the target populous had to be increased. In light of this, other courses had to be identified which, though less appropriate, nevertheless bore some relationship to those courses originally deemed ideal. These extra courses chosen for analysis included BTEC Diploma and Certificate courses, and City & Guilds craft level bodywork and spraying courses. These courses all had, in their first year, a similar level of theory and practice, and it was only in the second year that the BTEC course differed greatly inasmuch as there was a greater emphasis on maths and science. However, despite this increase in the range from which to gather information, there was still only a small target populous. The information gathered from the survey, therefore, could only be gathered a small number of female engineers.

By using trade papers and magazines in the initial stages, it was possible to gain 'snippets' of information that could be used to lead onto other sources of information such as educational journals. From these sources several colleges were pin-pointed where young women were enrolled on engineering courses. However, in some cases these students did not fit exactly within the research criteria. It could be that they were not on a suitable course, or they were not within the age range (women returners, etc). However, not all contacts were unfruitful and it was possible to compile a small list of colleges where young women were enrolled on engineering courses and who did meet with all the research criteria. The establishments chosen were selected after having been initially contacted by telephone to ascertain whether or not they had any female students who fitted in the research brief. From this initial list a number of interviews were arranged either at the students workplace or educational venues in Bath, Weymouth and Bradford and Ilkley.

This telephone exercise was very time consuming as there are no specific records kept by any training bodies such as EnTra (EITB), City & Guilds, MAA (Motor Agents Association), RTITB, etc., which list the number of young women who are at present undertaking engineering training in colleges of further education or any other training establishments. It is possible to obtain the total number of young women who are registered to take the City & Guilds examinations, however, it does not give precise details of the students or where they are studying (see Appendix 5).

Due to the time taken to establish initial contact with the colleges, and to compile a list of colleges where women were studying engineering, time ran out and it was not possible to carry on as the academic year finished as did the courses. This meant that some of the initial contacts and lists were out of date and would have to be brought up to date again once the new college year began in September 1992. Not all colleges had to be contacted again as the initial list had included details of the year and course that young women were enrolled upon and whether or not they would be continuing with their individual courses.

Further into the research the ECCTIS 2000 CD-ROM search computer program became available so it was used to establish the actual number of colleges in England and Wales offering Motor Vehicle courses that fit within the research specifications. This search was carried out on 8 November 1994. From the search the following information was obtained (see Appendix 1).

(a) The total number of colleges of further education listed on the programme was 201.

(b) From these colleges of further education, there was a total of 984 different courses being offered.

(c) The actual number of Craft Motor Vehicle courses being offered by colleges of further education was 186.

NOTE: These figures are only a snap shot of colleges offering Motor Vehicle courses.

It has been envisaged that there will be a reduction in the number of Motor Vehicle courses being offered by colleges of further education. This is mainly due to the new standards that have been imposed by the new Training Standards Council - MITSC (Motor Industry Training Standards Council), who have specified that all training establishments must have vehicles that are fitted with current technology. This basically means that vehicles less than five years old will have to be used by the training establishments, resulting in a very large financial outlay having to be met by already hard-pressed training providers who are receiving increasingly less funding from the Further Education Funding Council (FEFC). Many colleges will take the inevitable decision to close down high cost courses such as Motor Vehicle courses. Therefore, the data obtained from the ECCTIS 2000 program needs to be handled with these changes in mind. This forecast has been borne out in as far as that several colleges have reduced both their motor vehicle and engineering lecturing staff and subsequently courses have also been closed down. One local college has reduced its motor vehicle lecturing staff from 10 down to 3 and have closed their engineering courses completely.

From the 201 colleges identified, a random selection of 17 colleges was made. This selection did not include the colleges previously used: Weymouth, Bath, Yeovil, Exeter, Bradford and Ilkley, etc., which altogether constitute a selection of approximately 12% of total further education colleges within England and Wales. The heads of department of these extra colleges were contacted by telephone in order to carry out a telephone survey to establish the actual number of young females between the ages of 16 and 19 years enrolled on their motor vehicle courses.

From this telephone survey the following situation was established:

(a) 10 colleges (59%) contacted did not have any girls enrolled on their Motor Vehicle courses.

(b) 4 colleges (23%) had young women enrolled on women's returner courses. The ages ranged from 24 years upwards, therefore they were outside the research brief.

(c) 3 colleges (18%) did have one or two girls enrolled on their Motor Vehicle courses and were within the research brief.

It was felt that in the long term these 3 colleges would not be of benefit to the research due to the small number of young women enrolled and the distance that would have to be covered to carry out any form of longitudinal case studies which would include carrying out taped interviews.

Because of the numbers of colleges and distances involved, and as the object of the survey was primarily aiming to receive both factual information and an insight into students' personal experiences and feelings, it was decided to use postal questionnaires in the initial stages followed by interviews as the most suitable method of obtaining information.

QUESTIONNAIRE FRAMEWORK

Before starting any work on designing a questionnaire or deciding the questions to be asked in an interview, decisions had to be made about what information was required. A list of categories was drawn up, and from this list the questionnaire was developed. Before the questionnaires were printed several semi-structured interviews were carried out with various young male and female students who had either (a) completed an engineering course successfully, (b) failed to complete their course, (c) had completed part of their course, or (d) were thinking about starting an engineering course. These semi-structured interviews were carried out at either their place of work with the co-operation of their employers or at their local college of further education. These semi-structured interviews took the form of the student being asked several predetermined questions which they would answer and then be asked to expand upon. Within reason time was allowed for them to talk freely about whatever they felt was relevant or would be of interest to the research. All responses and discussions were carefully recorded during the interview and typed up later. These typed copies were shown to the interviewee after to ensure accuracy. The experience gained from these interviews made it possible to assess which questions gained the best responses, the order in which the questions should be posed and how

the questions should be phrased on the questionnaire. The first attempted questionnaire was then formulated for the three targeted groups. These groups included:

(1) students who had not yet completed their course but were still at college;

(2) students who had left without completing the course (this group has been hard to locate);

(3) students who had successfully completed their course (or near completion of their course);

A survey amongst the lecturing staff and students was carried out to ascertain the most appropriate colour of paper that the questionnaire should be printed on, and type of font, in order to maximise the response rate. The survey was based on 114 people - 10 lecturers (8 male engineering lecturers and 2 female lecturers) who taught on mixed foundation courses, with the remainder being engineering students and foundation students. Various examples of printed coloured questionnaires were shown and people were then asked which colour would encourage them to complete and return the questionnaire. The results of the survey are shown below in Table 16.

Colour	No of Votes	Percentage
Gold	34	30%
Light Green	12	10.5%
Light Blue	36	32%
Lemon	14	12%
Grey	12	10.5%
Salmon	4	3%
White	2	2%

Table 16

Results of questionnaire colour survey

Results of Questionnaire Colour Survey

Although the light blue coloured questionnaire received the largest number of votes (32%), it was felt that this may have been because the largest majority of people surveyed had been male (approximately 75%). As this questionnaire was to be sent to both male and female engineering students, it was considered that light blue was not necessarily the most appropriate colour because of its association to the male gender. On reviewing the results a decision was made to use gold, the next highest voted colour which had received 30% of the votes.

Questionnaires were sent to both male and female students studying in mixed groups so that an overall and balanced viewpoint could be obtained. The survey was to be based on a small-scale survey of several colleges of further education in England and Wales. A postal questionnaire was also sent out to Yeovil college where a group of young women were undertaking different motor vehicle engineering courses which included body work, mechanics at craft levels (1st, 2nd and 3rd years) and first year BTEC. There was a high return from these questionnaires. The primary reason for this high

return was that the college staff co-operated by collecting the completed questionnaires in sealed envelopes. In this way confidentiality was maintained. The information gained from these questionnaires is dealt with in another part of the following chapter.

In addition to this, the students' progress throughout their training would be monitored over a three or four year period depending on the length of course. In this way the changing attitudes and perceptions of their career and training, both at college and at their place of work, could be assessed to highlight the good and bad aspects of their training. Any student who dropped out would be contacted to discover the reasons for their failure to complete the course and be asked if they had any suggestions for improvements.

This first attempt had several faults that had to be rectified. These faults included leading questions, incorrectly phrased questions and insufficient questions to gain the necessary information required. The second and third attempts were further improved upon. These improvements included increased spacing for the respondents' answers and changing some of the wording so that it was kept standard (see Appendix 6).

Rationale

Figure 7 (p 62) illustrated how the student was subjected to external influences which could affect their will to proceed with a course. Three key external influences were identified:

(1) Level of employer support;
(2) Level of educational support (from teaching and non-teaching staff);
(3) Degree of parental support.

The diagram also illustrated the effect of group dynamics on whether or not an individual student was fully accepted into a group.

Having identified these areas of influence, the questionnaire was designed to:

- ascertain students' perceptions of the effect of the three key areas of influence on their own situations.

- ascertain students' perceptions of the effect of group dynamics on their own situations.

In addition, it was necessary to gain a view of students' perceptions about course design and structure and to collect data for analysis to establish whether any particular patterns emerged. The completed questionnaires would also be used as a means of identifying several female case studies. They would also be used as a basis in the initial case study interviews and also as a means of checking the validity of answers given by the students.

Discrete observation of the student during, where possible, the college day in classroom and workshop situations would present opportunities for validating the data collected from the questionnaires. To perform further validation checks, lecturing staff who had direct contact with students would also be asked informally how the student was coping with the work, other members of the group, and other members of staff. Employers/training agencies would also be contacted where applicable in order to discuss informally how the student was coping with the work presented to them at their place of employment, and how they fitted in with work colleagues. It should be noted that in many cases this contact would have to be made by telephone due to distance and time constraints.

EXPECTED RESULTS

From the questionnaires I expected to gain as wide a spectrum of students' perceptions as possible from both male and female engineering students. These perceptions should indicate where the students themselves saw the barriers and would suggest where improvements or changes needed to be made with the result of improving both the retention and recruitment of female engineering students. These perceptions would then be discussed further during case study interviews where the selected students would be asked to expand on their written answers and relate their own personal experiences of support or discrimination and how these manifested themselves, and how it was dealt with. These findings would then be used in my final suggestions and conclusions.

The following questionnaire breakdown gives a rationale of the expected results to be gained from the completed questionnaire.

QUESTIONNAIRE BREAKDOWN

QUALIFICATIONS GAINED AND LEVELS

This question is used to compare the qualifications that each student gained prior to enrolling on to the craft course. This demonstrates that no set level of qualification is required to either enrol on to the course, or to be successful. It also enables the researcher to contrast the subjects that the girls have chosen with those taken by the boys and to establish if the girls who have chosen engineering also chose non-traditional subjects whilst at school. Subjects such as maths and science which EnTra (1987) stated that girls were less likely to follow at GCSE levels.

FUTURE AIMS

Where the students see themselves once they have completed their course. It is also aimed at establishing how much thought has gone into considering their career choice and their future options and whether or not they have fully explored their chosen careers.

Continued ...

When did you decide to become an engineer?

By establishing at what age the student decided to become an engineer will be an indication of the amount of time taken and thought by the student to reach their decision.

What influenced your decision to become an engineer?

This now seeks to establish what outside influences may affect a student's choice of career, particularly in a non-traditional career.

If you decided whilst at school did you ask any of your teachers for advice concerning your career choice? If so what was their advice/comment to you?

This establishes what advice was given to the student whilst at school and enables a comparison to be made concerning the advice given to both male and female students.

Did you seek advice from anyone else? If so, who, and please state what advice they gave?

This is aimed at probing whether the student sought further advice from any other individual or organisation and what this advice was, whether supportive or otherwise.

Do you feel that the advice given by any of the above was helpful or unhelpful?

This explores the students own perceptions of the advice that they received.

What was the reaction/attitude of your parents when you first told them you wished to become an engineer and has it since changed? If so, in what way?

This question is to establish the attitude of the parents when they were informed that their child, particularly female child, wished to become an engineer and to compare the differences in attitude of both mother and father and differences between the attitudes of male and female students.

What was the reaction/attitude of your friends when you told them you wished to become an engineer and has it since changed? If so, in what way?

This seeks to establish the reaction of those outside the family but who are close to the student and may have some influence on a student's employment choice.

Are either of your parents employed in engineering? If so please indicate what type of engineer they are, eg electrical, mechanical, etc.

This is being asked to state whether either of their parents are engineers and establish the possibility that the student's career choice was linked directly with parental influences, ie role models.

When you enrolled at college did you find the experience:-

Very easy? *Fairly easy?* *Difficult?* *Very difficult?*

Please give a brief reason why you found it one of the above.

The experiences of the student when they first enrolled on to an engineering course at college are being sought and whether or not they encountered any hostility or difficulty of any kind, or whether they had positive experiences on enrolment.

Continued ...

Do you think the lecturers are helpful and sympathetic to your needs? Please describe your feelings about the lecturing staff.

This question seeks to establish whether the students felt confident with the staff and whether the staff were helpful and encouraging once they had enrolled on to the course.

Which of the following best describes the attitude of your fellow students?

Female	***Very friendly?***	***Friendly?***	***Unfriendly?***	***Hostile?***
Male	***Very friendly?***	***Friendly?***	***Unfriendly?***	***Hostile?***

The student is being to tick the box which they feel was appropriate to describe the attitude of their fellow students so that it may be possible to establish how the students fitted in with other students within the group.

What do you think about the attitudes of the lecturing staff that take your group?

(a) Towards others.

(b) Towards you.

This question was aimed at establishing whether the student observed any form of discrimination in the way in which the lecturing staff dealt with both male and female students.

What were your feelings during the first few weeks of the course?

The experiences of the student are being sought in order to establish how the students (particularly female) coped with the first few weeks of the course as this is the most unsettling part of the course as students are vying for peer position and acceptance.

Did you feel you had the necessary support from college staff in the first few weeks of the course? Please give reasons for your answer.

The question is to establish the level of support that the students received during this unsettling period and was an alternative way of establishing whether there had been any discrimination on the part of the lecturing staff.

Do you feel that you could talk to any member of the teaching staff about any problems whether personal or academic?

This question is a continuation of the previous questions dealing with the students' perceptions of the lecturing staff who would have had direct influence on the students' lives at college and therefore the lecturing staff may be seen as trusted mentors.

Do you feel that the appointment of a female lecturer to teach engineering would be of benefit for female engineering students? Give reasons for your answer.

The question explores whether a female lecturer would be a benefit to female students enrolled on non-traditional courses and whether they could act as role models.

Continued ...

Do you think the personal facilities (toilets, lockers, etc.) are adequate both at college and within your work placement?

This question explores the facilities offered by colleges, in what, no doubt, is a male-dominated area resulting in facilities specifically designed for male students and therefore may not meet the needs of female students.

On which basis would you prefer to attend college?

Day release *Block release* *Full time*

In this question the students is asked what mode of attendance they would prefer, whether they would prefer to be (in the case of female students) protected to some extent within the educational environment whilst gaining knowledge and experience before entering mainstream employment, or whether they would prefer to be plunged directly into full time employment.

If given the option would you prefer to go into a segregated group? Please give reasons for your answer.

This question tries to gain the view of whether or not the students would feel more secure in a single sex class rather than mixing with members of opposite gender.

The following three questions are similar in their quest in trying to establish how the student was accepted and supported by their employer and working colleagues.

In the first few weeks of starting work were you given sufficient help and assistance regarding settling in? Please give reasons for your answer.

What do you think about the attitude of your employer?

(a) Towards the work force. *(b) Towards yourself.*

What do you think about the attitude of your fellow workers towards yourself?

Do they treat you differently to anyone else?

YES *NO*

Chapter 4

Chapter 4

INITIAL SURVEY

The initial pilot survey was aimed at a total of 45 motor vehicle engineering craft students. These students were studying on the first, second and third years of their courses. Ages ranged from 16 to 20 years, however, within this group of 45 there were some students who were above this age and had either enrolled on the course as an older student or as part of a retraining scheme.

Of the pilot questionnaires sent out, 40 were returned, but 2 of these were spoiled, so although the return rate was 89% ($^{40}/_{45}$ x 100 = 89%), only 84% ($^{38}/_{45}$ x 100 = 84%) was usable. This high return rate was primarily due to the assistance afforded by the lecturing staff who kindly allowed the students to complete the questionnaires in college time and who then collected the sealed envelopes containing the completed questionnaires.

These initial pilot questionnaires provided the basis on which the final postal questionnaires were to be based. In actual fact, it was felt that the level of questions and wording were correct. The small changes made included altering certain questions and changing some questions into tick box type answers. Therefore, the questionnaires that were originally sent out during the initial pilot survey could legitimately be used as a direct comparison with any and all other postal questionnaires returned from any of the other colleges.

COMPILATION OF QUESTIONNAIRE DATA

The compilation of data is comprised of questionnaires, including those sent out during the initial pilot survey. The questionnaires have been sent out over a period of three years to both male and female Motor Vehicle students enrolled at various colleges of further education. These colleges included:

(1) The City of Bath College of Further Education;
(2) Bridgend College[6] which runs a segregated women returners Motor Vehicle course.

Over the three year period the intake onto the Motor Vehicle courses at these colleges varied from year to year to the extent that in some years no females enrolled at all. This means that there has been no continuity from year to year of first year female students at some of these colleges. One such college was Bridgend which had, when first contacted, two female students enrolled on the 383 City & Guilds Motor Vehicle course. One was enrolled on the first year of the course whilst the other was in her final year of the course. The following year there was only the one female student who had progressed from the first year. In the third year there were no female students enrolled on to any Motor Vehicle course at this college. The female student from the previous year left prematurely for

[6] Questionnaires were sent to Bradford and Ilkley Community College although the students at this college were outside of the target populous inasmuch that they were women returners whose ages ranged from 25 to 50. It was felt that the information gained from sending questionnaires to this group of women engineers would be of value because of their experiences and their maturity in answering the questions posed. Their questionnaires were not included in the breakdown above but were used simply for background information.

unknown reasons. This situation was not extraordinary. There were only two or three colleges which had been contacted that had a continuous regular intake of female Motor Vehicle students. Questionnaires were sent out for a fourth year but the information gained was very similar to that already received. At this point it was felt that saturation point had been reached.

BREAKDOWN OF QUESTIONNAIRES

Out of 150 questionnaires sent out, 120 were returned giving an approximate return rate of 80%. Again, as in the case of the initial pilot survey, the high return is due to assistance given by the lecturing staff in these colleges.

The returned questionnaires were broken down in the following manner:

Female Students: Total number returned - 29

Age Groups	*No of Returned Questionnaires*
16-19	18
20-23	3
24-27	3
28+	5

Percentage of questionnaires returned by female students - $^{29}/_{120}$ x 100 = 24%

Male Students: Total number returned - 91

Age Groups	*No of Returned Questionnaires*
16-19	54
20-23	18
24-27	6
28+	5
Spoilt paper	8

Percentage of questionnaires returned by male students - $^{91}/_{120}$ x 100 = 76%

From these figures it is clear that approximately one quarter of the total of returned questionnaires was from female students. This constituted a sizeable population allowing the data gained to be viewed as a true picture of experiences encountered by female students. The total number of young female students aged between 16 and 19 years was 18 and therefore for true comparison of like for like should be made using the figures gained from the returned questionnaires of male students within the same age group. The number of 16 to 19 year olds who completed and returned their questionnaires was 18 female and 54 male, so as a percentage these figures can be illustrated as:

Total questionnaires returned by 16 - 19 year olds, both male and female:

Female	18
Male	54
	72

Percentage of questionnaires returned by female students, 16-19 years - $^{18}/_{72}$ x 100 = 25%
Percentage of questionnaires returned by male students, 16-19 years - $^{54}/_{72}$ x 100 = 75%

If the 20-23 year old groups are also included due to their proximity to the age group concerned, it would mean that in most cases they would have been within the target age group when they initially enrolled on their Motor Vehicle courses. Consequently, their views and perspectives should also be viewed as valid. So again, a total percentage of 16-23 year olds can be illustrated as:

16-23 year old females	21
16-23 year old males	72
TOTAL	93

Percentage of questionnaires returned by female students, 16-23 years - $^{21}/_{93}$ x 100 = 23%
Percentage of questionnaires returned by male students, 16-23 years - $^{72}/_{93}$ x 100 = 77%

These percentages are very close to those for just the 16-19 year group. Therefore, these figures can be included without fear of corrupting or jeopardising the final data. The advantages of including these students by far outweighs any disadvantage that may occur. Their ***additional*** experience will add more colour to the total picture. Including this age group (20-23) there are only a small percentage of questionnaires that are not used. In one case, 8 questionnaires were spoilt, whilst the others were outside the age group, ie 24 plus. Therefore, the actual percentage of usable questionnaires is:

Completed questionnaires returned by 16-23 year old female students	21
Completed questionnaires returned by 16-23 year old male students	72
TOTAL	93
Total number of **all** returned questionnaires	120

Percentage of usable questionnaires - $^{93}/_{120}$ x 100 = 78%

This high return rate coupled with a high usable rate of questionnaires, plus the high percentage of young female engineering students contacted, would indicate that the data gained can be viewed as being typical for all 16 - 19 year old female Motor Vehicle students.

ANALYSIS OF QUESTIONNAIRES

Qualifications

When comparing the qualifications gained, only the GCSEs were used. Other qualifications such as RSA were not included as there was no direct comparison. The reasoning behind this was that this qualification is gained at the end of compulsory schooling, so both male and female students should have these qualifications in common. When reviewing this information the grades were recorded in table form and each grade was marked down. Only the maths and science subjects were taken into

account as these two subject areas are recognised as being the two main subjects necessary for engineering. By doing this it was also possible to establish whether the girls who chose engineering, also chose maths and science. It was interesting to see that the Welsh schools still split their science subjects into the three disciplines physics, chemistry and biology, whereas the English schools group all sciences together. When reviewing the Welsh returned questionnaires, it was obvious that both male and female students had sat the physics examination, and their level of grade. With the English schools, to some extent, assumptions had to be made with regard to their competence in particular sciences.

	SUBJECT	GRADES					
		A	B	C	D	E	F
Female	Maths Science (Combined) Science (Physics)	5%	19%	33% 24% 5%	24% 24% 19%	19% 19% 5%	
Male	Maths Science (Combined) Science (Physics)	3%	7% 7%	37% 13% 10%	23% 30%	23% 20% 13%	10% 10%

Table 17
Comparison of GCSE qualifications

Many male and female students did not give clear grades or subject details and thus they could not be recorded.

From the table it can be seen that there was very little difference in the GCSE results of male and female students, even though there are no formal entry qualifications for craft courses. All students were eligible to enrol onto a craft course but some were qualified to enrol onto BTEC courses. This course is more academic and many students are attracted to a practical rather than academic qualification.

As to the question of GCSE subjects chosen, the questionnaires returned from the female students revealed that the girls did choose maths and science subjects whilst at school. Table 17 shows that the girls also gained higher grades than the boys, ie two of the highest grades (A & B) in Maths and Science (Physics) were obtained by girls. This research does not attempt to answer categorically whether more boys select maths and science than girls. However, it does indicate that the girls taking part in this research ***did*** choose maths and science and ***did*** obtain overall higher grades than those achieved by the boys.

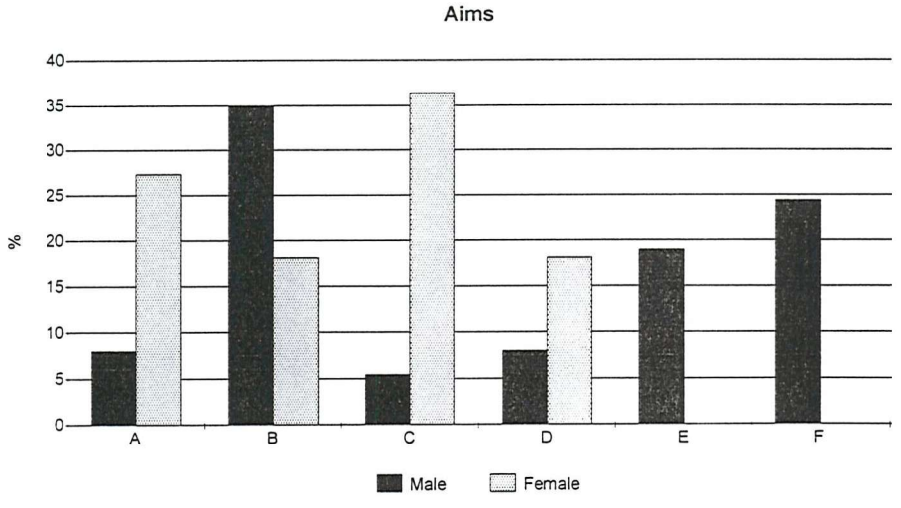
Whether this subject selection is due to any external influence cannot be established, but if question 3 is taken into consideration, ie 'When did you decide to become an engineer?', then possibly the selection of maths and science was due to forward planning by the students.

Students' Future Aims

From the results of the questionnaires it was possible to divide the results into six clear groups which are listed in Table 18. The female engineers' aims were grouped fairly closely together and had a wider view of their future careers and prospects whilst the majority of male engineers had a very short term view in that their main aim was simply to become qualified, whereas the female engineers were planning their future career path. What was interesting was where the female engineers had a high percentage, the male engineers' score was low. One interpretation of this could be that the female engineers were more ambitious than their male counterparts and were planning for their future, unlike the male students who were planning short term. This raises the question 'Why do many fail to complete the course?'.

AIMS	MALE %	FEMALE %
To own their own business	8	27.3
To become qualified	35	18.2
To gain further qualificationsTo enter into management	5.5	36.4
To progress into another occupation	8	18.2
No answer	19	-
	24.4	-
TOTAL	100	100

Table 18
Percentage breakdown of students' career ambitions



A - To own their own business
B - To become qualified
C - To gain further qualifications
D - To enter into management
E - To progress into another occupation
F - No answer given

Figure 8

Once again, it can be seen from the results that there is a marked difference between when the girls decided to become engineers and when the boys made their decision (Table 19). The majority of girls decided at the age of 14, whereas the boys only chose their career at the age of 16 when they no doubt were in their final years at school. It can therefore be assumed that they had not considered their career prospects when choosing their options at school. On the other hand, the girls chose their career at about the same time as they would have been choosing their options, ie planning for the future.

YEARS OF AGE	MALE%	FEMALE%
11	-	9.1
12	2.7	-
13	5.4	18.2
14	10.8	36
15	16.2	18.2
16	35.1	-
17	5.4	-
18	-	9.1
Plus	-	9.1
No answer	24.3	-
TOTAL	100	100

Table 19
Percentage breakdown of the age at which career choices are made

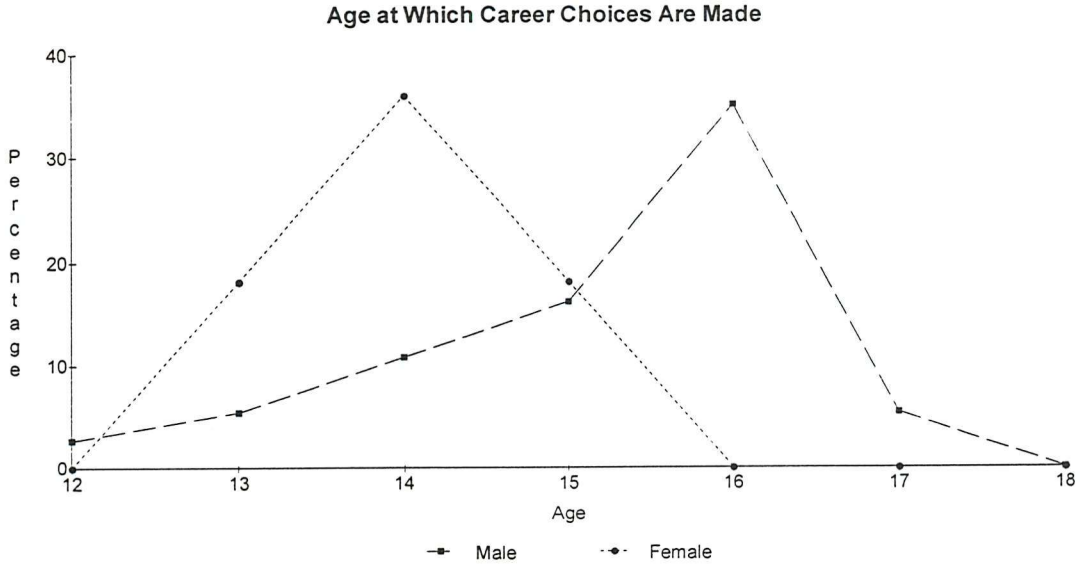


Figure 9

Influences in Choosing Engineering

The majority of female engineers chose their career options because of their fathers' influence (see family connection) or because of the experience gained whilst out at work placement. It was also the work placement that influenced the majority of male engineers. A high percentage of males were also influenced by their fathers. This illustrates the powerful effect that parents have on their children's career choice and also the effect that a school has if it does not practice a close relationship with prospective work placement providers.

Advice from Schools

The majority of girls approached their teachers to discuss their chosen career and career prospects, but the advice given was fairly evenly split into being supportive and non-supportive. A typical supportive comments offered from teachers was 'Go for it', whereas typical non-supportive comments ranged from 'That's a man's job' to 'You won't have a hope in hell of being taken on'. (These comments have also been made by some careers advisers.) In the case of boys, however, the majority of them did not ask their teachers for advice although those that did were given supportive advice.

In the case of a fair majority of girls, if they were not committed to becoming an engineer, they would have been put off by their teachers' comments. Despite negative attitudes such as this, however, some girls do decide to enter engineering, so again it is becoming obvious that any young woman who even considers becoming an engineer has to be determined and not be put off by negative attitudes. By getting as far as actually enrolling on a college course, these young women have shown themselves to possess a higher amount of determination than their male peers who have not had to face the same negative social attitudes. So once again the question must be asked 'Why then do these determined young women fail to complete their courses?'.

School and careers advisers did not come out very well in this survey. Many students did not bother to go to them for advice. One possible reason for this reluctance may be illustrated by a comment from one student who said that they (the adviser) had no idea of engineering or what it entailed. Those that did seek advice from careers advisers were simply given an application form to complete in order to enrol with a local training agency with no further explanation or advice about their career prospects, etc. Others were told, as in the case of one young female student, that this was no a job for a woman and had she considered nursing? In another case the advice given by one teacher to a young pupil was just to go out and find a job.

Parents and friends' advice was sought by many young prospective engineers and again the advice given ranged from 'go to the college and talk to them' to 'make sure it's what you want to do before deciding'. This group of advisers seemed to have been more supportive and helpful by giving constructive suggestions and encouragement. NOTE: In the case of one student he approached a social worker for advice as he was deaf. The social worker put him in touch with an interpreter who would go with him for interviews and also when he enrolled at the college to assist with enrolment.

Parental Attitudes

In most of the female cases parents were a little apprehensive to begin with but subsequently became very happy with the choice and supportive of their daughters. In the case of the male students most were pleased with their sons' career choices, and again were supportive of them, however, some parents subsequently became a little concerned with either the low pay or the health aspects of the engineering career and would prefer it if their sons, once qualified, left the trade to find alternative employment. Only the parents of one male student were averse to their son entering a career within engineering as they felt he was more suited to a collar and tie job in an office.

Friends' Attitudes

All friends were supportive and helpful. In the case of one or two female students they were a little concerned that they may not be making the correct career choice but had since changed their minds and become supportive and interested in their choice of career.

In the case of the majority of the female students (73%) their fathers were employed as engineers, either electrical or mechanical. In the case of the male students it was a fairly even split with 52% of the parents not employed as engineers and 48% of those who answered the questionnaire. It is therefore fair to assume that the majority of young women engineers had had some insight of the engineering industry and what it could offer them in terms of career prospects, job satisfaction and their own personal development, albeit through the eyes and experience of their fathers.

The fact that parents are one of the most influential factors when young women are making their career decisions, and during the transitional period between school and training, is also supported in Valbjorn & Hansens' report, (1992).

Ease of Enrolment

The majority of students found the ordeal of enrolment fairly easy. The whole operation was straightforward and when a student was in difficulty the staff were on hand to give assistance. None of the female engineers found this a problem and were not put off by the experience. One suggestion made by one of the female engineers was that it would have been a good idea to have a counsellor at hand in case someone needed advice that the lecturers were not able to give. This advice could be concerning grants, travelling arrangements, or simply an opportunity to talk things through with an independent person.

Sympathetic Lecturers

Two younger female students felt that they did not receive the necessary support from the lecturing staff. One of these felt that one or two of the lecturers held the opinion that engineering was not a career for women. Just over half of the women engineers felt that they did receive the necessary support from the staff. The remainder were of mixed opinion where some lecturers were helpful and

supportive whilst one or two were not. In the case of the male engineers just over a third felt that they had the necessary support and just under half were again of mixed opinion. In both cases only a small number felt that the staff were unsympathetic and unhelpful (see Dawn, p 101).

Fellow Students' Attitudes

Most students, both male and female, on average found that the attitude of their fellow students was friendly. An exception to this was expressed by a student who felt that both male and female students were hostile to him. One female student made the remark that a small number of students were a little difficult, but she did not elaborate further. However, for a large number of women engineers they were the only female in the group so they could not comment on how they were viewed by other female engineers (see Pam and Hannah, see pages 112 & 109).

Feelings in the First Few Weeks

The main concerns of most of the women entering an engineering course were:

(1) Worry about the course;
(2) Worry about the group;
(3) Worry about their level of knowledge or perceived lack of knowledge.

The others expressed worries about their age and feeling out of place.

The male engineers had an initial anticipation that they would become disillusioned with the course as they expected to be solely based in the workshop without theoretical activity. By the time several weeks had passed, this ceased to be a concern of many students as they had become absorbed in the course with its variety of activities.

Support Given in the First Few Weeks

In both gender cases the majority felt that they did receive support and guidance whilst at college. However, approximately 25% of engineers of both genders said that they did not receive help and support from the college. No reason was given why they thought that they did not receive support nor what support was necessary.

Could You Talk to the Lecturers?

A clear majority of the male engineers said that they could talk to the lecturers with relevant ease about personal and academic problems once the initial introductory period was over. With the female engineers, there was not such a large majority difference between those who could talk to lecturers and those who could not (a difference of 10% of those who ***could*** talk to the lecturers). 18% of female engineers could only talk about academic problems and not anything personal.

Appointment of a Woman Lecturer

In this section the results were a little surprising inasmuch that in the case of the male engineers who answered the question (which most did) there was a clear consensus that a female lecturer would be a benefit. In the case of the female engineers, there was only a difference of 9% in favour of a female lecturer. Some students of both genders did make the comment that provided the lecturer knew what they were doing, and not just given the job because of a positive discrimination policy, it did not matter whether they were male or female. It was therefore desirable to encourage more women to teach engineering but not to the detriment of the subject. One reason given by a female student on the negative side was that men express themselves better.

NOTE: The INNOVAM project employs female consultants who can be contacted by any of the women students that are participating on the MV course.

Facilities

As far as the male engineers were concerned the facilities at both college and work were adequate whereas with the female engineers the majority of them were dissatisfied with the facilities at college, and those students who were not on full time courses and employed, there was an even split between those who were satisfied and those who were not. One main criticism of female engineers made by those who were employed was that they had to use customer toilets which were often some distance away from the workshops.

Method of Attendance

On this question both male and female engineers had complete opposite opinions. The majority of female engineers preferred to attend college on a full time basis, whereas the majority of male engineers would prefer to attend college on a part time basis.

Segregated Groups

This section again produced some surprises. Almost 82% of female engineers stated that they would prefer not to be segregated and 56% of the male engineers also expressed a dislike for segregated groups. The other 44% of male engineers were split into 'no answers given' and 'don't mind'. Only 3% of the male engineers said they would like to be in a segregated group. None of the female engineers wanted to go into a segregated group. This view has been further supported by the IRIS forum held in Brussels in October 1992, in which they reported that although there are a variety of women-only courses on offer throughout the EU, many women would still choose to study in a mixed group. Their reasons are similar to those given in this research, ie they realise that in the future they will have to work with men, Murphy and Molyneux (1993).

Employers' Support

The majority of students who were employed felt that the support given by their employer was satisfactory.

Employers' Attitude to Both Students and Workforce

This question is reasonably complex as it asked the student not only to consider the attitude of the employer towards them, but also whether there was any change of attitude by the employer when dealing with the rest of the workforce. In the case of the male engineers the majority of them said: 'No, there was no difference between the employer's attitude towards them and the rest of the workforce'. However, with the female engineers there were differences, and these differences ranged from employers being more helpful towards them and treating them like the rest of the workforce, to being unhelpful when compared with the rest of the workforce.

Attitude of Colleagues

The majority of male engineers stated that they were treated the same by the workforce. However, with the female engineers the majority felt that they were treated differently. They were treated more kindly than if they were male and if they were in difficulty someone was on hand to help them, and the general feeling was that this would not have been the case if they had been male. They felt a male would have been more likely to have been told to sort it out himself.

INTERVIEW ANALYSIS

From the questionnaires a total of 12 female students were identified to take part in case studies. The students were selected because they fitted closely to the ideal criteria which has been identified earlier in the research. In essence, the criteria were that the students must be enrolled onto an engineering or motor vehicle course and they must be aged between 16 and 20. In point of fact, because of the very low numbers of young women taking up engineering as a career, the case studies in reality identified themselves.

The interviews were carried out either at the students' places of work or within their college or training establishments with the agreement of their employer or college. The interviews took the form of a semi-structured session and the questions posed were similar to those asked on the postal questionnaires. The advantage of conducting interviews rather than relying solely on questionnaires was that it allowed the researcher the opportunity to discuss and expand to some depth the answers that the interviewees gave. The main disadvantage with this method of research was that it was more costly in terms of both time and finances.

The interviewees were similar to those who had participated in the postal questionnaires and covered a wider range of courses which included:

1. 381/2 Motor Vehicle Craft Studies;
2. 201 Engineering Craft Studies;
3. 205 Engineering Craft Studies (4th year);
4. 201 School Link Engineering Course;
5. Career Foundation Course;
6. BTEC Diploma in Mechanical Engineering;
7. BTEC Mechanical Engineering, 2nd Year National Certificate;
8. BTEC Electronic Engineering, 2nd Year National Certificate.

Each of the students had a variety of experiences, such as two who had successfully completed their courses - one who had found employment as a motor mechanic in a franchised garage whilst the other had recently left her employment to join the Royal Navy as a mechanical engineer. One of the young engineers had failed to complete her first year and was studying for a BTEC National Diploma in Business Studies. A fourth interviewee went through a great deal of unpleasantness in her first year of a full time course. This unpleasantness manifested itself in the form of victimisation which resulted on many occasions in her going into her bedroom at home and bursting into tears. This treatment almost caused her to abandon her course part way through the second term. However, through the intervention of her employer and support from the college staff, the situation was rectified and she was able to complete her course and progress onto the next level of study. The remainder were from a variety of courses which varied from a two hour per week school link course up to a BTEC 2nd Year National Certificate. In this way it was possible to obtain as diverse an opinion as possible of all of the relevant courses. As previously mentioned the questions were of a semi-structured nature which allowed the interviewer the opportunity to pursue any area of an answer given by the interviewee within a reasonable time allowance. The interviewer used the questions posed on the questionnaire so that there would be a direct relationship between both survey methods.

Observations

As with the questionnaires, the interviewees' qualifications, choice of career, attitudes of parents, college staff, colleagues - both at work and at college, and their employers' attitudes were established. Also, the interviewees' opinions of the course and of engineering as a whole was also sought and established. The following observations were then made and recorded.

Qualifications

The findings were very similar to those established by the postal questionnaires inasmuch that those who were taking the BTEC courses had obtained the higher grades in their GCSE examinations, and those who were taking the craft courses had obtained the lower grades in their GCSEs. The only exception was a female student who was attending a college on a school link course and had not yet sat her GCSE exams.

Aims

The interview method allowed the interviewer the opportunity to pursue this question in some depth. The observations made were again similar to those obtained from the questionnaires in that some students wished to proceed to higher education. Others wished to progress into management or onto technical adviser status where they would be required to move about either the country or world and advise on problems concerning the installation of equipment or its breakdown. The remainder either wanted just to become qualified or once qualified move into other forms of employment, as with the female engineer who had just completed her course and had already applied for and been accepted for a career in the Royal Navy as a mechanical engineer. This pattern of events was very similar to the pattern established from the analysis of the postal questionnaires.

Influences in Choosing Engineering

The fathers of the majority of female engineers interviewed were, or had been, employed as engineers of some description whether it be mechanical or electrical, or even motor vehicle. In the case of two or three fathers, they were employed as helicopter mechanics when they were members of the armed forces. In the case of one interviewee, both parents were engineers, the father having been in the RAF and was now working as a designer, and the mother who also now worked for the same company in the drawing office. Once again, as demonstrated by the postal questionnaires, it appeared that the influence of fathers was very strong. Also, work placements had their influence on the career choices of several who were interviewed.

Advice

On this question there were mixed answers ranging from no advice having been sought from either school or careers office, to a statement made by one interviewee "The careers teacher kept on asking me if I was sure about my career choice and warned me about the mickey taking". Others received mixed advice such as in one case where one teacher was very supportive and another was dismissive of the idea.

When Did You Decide to Become an Engineer?

Again, most of the female engineers chose their careers at an early age. There were one or two exceptions such as one female engineer who had already left school and was, in her own words, "Just dossing around". Her parents gave her an ultimatum that either she find a job or she would have to go to work in the family run garden centre. Her first approach towards training met with disaster when she contacted a local training agency to enquire about becoming a motor vehicle mechanic. The only comment she got from this training agency was that it would be very difficult to find a work placement for her. Undaunted, she contacted another training agency which dealt with mechanical engineering training. This agency was more helpful and sent her down for an interview at a small local firm where despite being in competition for the job with three boys, she was nevertheless successful in securing the position as a mechanical engineer trainee. It was interesting to note that when this particular

young woman was at school, she had chosen engineering drawing as an option for GCSE, but was continually discouraged by her teachers who informed her that she would be the only girl taking that option. She therefore dropped this option and chose a more traditional female option instead.

Parental Support

The majority of parents were pleased and supportive of their daughters' careers choices. One or two parents however did have doubts to begin with but soon changed their minds once it became clear that this was the type of work that their daughters wanted to do with the prospect of structured career progression. One father was concerned that his daughter would not be able to find employment after her training as a motor mechanic and would have preferred it if she had changed as a mechanical engineer where he felt she would be more likely to obtain employment. She is now employed as a motor mechanic and has been for the past six years.

Friends' Attitudes and Support

The answers given again bore close similarities to those given in the postal questionnaire in that some friends were initially unsure of the suitability of their friends' choice, but soon came round to accepting the idea. Others offered support from the outset with comments such as 'Good for you', 'Go for it', etc. Many of the friends were interested in what the interviewee was doing, either at work or at college and would ask what it was like to be an engineer and what it was that they were learning at college.

Attitudes of College Staff

Apart from one female engineer who felt that one particular lecturer was a little patronising in his approach to her, they all felt that the staff were helpful and treated both male and female engineers the same. This patronising took the form of assuming they did not know anything and the lecturer would turn to the interviewee and repeat the same instruction or explanation directly to her, or would turn to her and explain the simplest of things, ie 'this is a nut and bolt'.

Could You Talk to the Staff?

The majority of interviewees said they could talk to the lecturing staff concerning academic problems, but not personal problems. The young woman mentioned previously who faced problems in her first year, and had because of these had to talk it over with the lecturer in charge, still felt she could not talk to the lecturing staff other than to discuss academic matters. This is interesting because the lecturer concerned who helped to deal with the problem felt he had her confidence and was sure that she would come to him if she had problems at all. These feelings directly contradicted hers.

Would a Female Lecturer be of Benefit?

On this question the majority said that it did not matter who taught them provided they knew their job. Two female engineers (one of which had the unpleasantness in the first year) actually had two women

lecturing on their course - one for maths, and one for electronic principles. Both female students were of the same opinion that it was not of benefit to either of them and they still would not talk to them about anything personal.

Student Attitudes

Comments made about the attitudes of fellow students varied from being accepted straight away to the unpleasantness faced by the female student mentioned previously. In general, however, any 'mickey taking' was soon dropped, usually a couple of weeks into the first term. One young woman actually said that she was spared any unpleasantness simply because in her group there was a 'gawky lad' who the group (including herself) picked on, which resulted in him leaving the course before the end of the first term. In effect, the group's attention was diverted from the young woman who would have been a more obvious target.

Segregated Groups

None said that they would go into a segregated group if given the option. Reasons given range from 'I was in an all girl group at school and did not like the atmosphere' and 'Girls can be bitches', to 'You have to mix with male engineers sooner or later so you might as well start at the beginning'. Even the girl who experienced the unpleasantness still stated firmly that she would prefer to go into a mixed group. Also, the young woman who did not complete her first year and left because, in her own words: "I did not retaliate soon enough and therefore suffered a lot more mickey-taking", still said she would prefer a mixed group but would have liked it if she was not the only female in the group. It should be stated that this was not the only reason for her leaving the course. Another reason for her leaving was due to ill-health.

Methods of Attendance

This was mixed. Some chose day release whilst others preferred full-time. There was no clear difference between preferred methods of attendance, unlike the preferences established in the postal questionnaire.

Attitude of Employers

All the interviewees felt that their employers gave them the necessary support and help during their initial starting period. This finding cannot be considered surprising as any employer prepared to take on a young woman as an engineer in the current social climate must have considered the implications and be aware of the difficulties.

Some of the students found that the employees were very friendly and helpful and did not treat them any differently to anyone else. In one or two other cases, some unpleasantness and unhelpfulness was experienced. However, in time the majority of female engineers were accepted and all individuals were treated equally once they had shown that they were capable of doing the work.

TO SUMMARISE

From both research methods used it is apparent that college lecturers are supportive and, in general, were helpful and approachable. As for parental support, after an initial period of misgiving, parents became supportive of their children's career choices, particularly when they had been made aware of the possible career routes and future job prospects.

As for positive support from employers, a much wider view must be taken and not just that given by the students who took part in this research. If only the views of the research students were to be taken into consideration, then it would seem that employers are very supportive. This, however, is not a true reflection of the actual situation of employer support. Page (November 1997, Issue No 41) writing in the November issue of FE Now, clearly illustrates the difficulties associated with finding work placements for female students seeking training in engineering. She quotes one college which mentioned that there was an active bar by local employers on women seeking motor vehicle qualifications. These employers could not be persuaded to provide a work placement for female students wishing to become motor vehicle mechanics. This is the norm rather than the exception, and the problems associated with gaining work placements and employer support has been commented on throughout this research in respect of my own findings and the findings of others (Van der Craats et al).

It is apparent that the support of employers is an area where maximum effort needs to be concentrated to ensure that the three pillars of support necessary as highlighted in my hypothetical model on page 62 are established. How this support is to be achieved will be discussed in the final chapter.

Chapter 5

Chapter 5

CASE STUDIES

Postal questionnaires were sent out over a period of three years. During this period also, several one-off interviews were carried out to ensure that:

(a) the questionnaires were designed correctly with regard to wording, etc;

(b) the data being obtained from the questionnaires was a true picture of the interactions between student/student and student/lecturer, etc.

These interviews also enabled the researcher to gain by observation an insight into the respondents' working/learning surroundings, plus a more in-depth knowledge of their attitudes and views. In other words, they provided the colour with which to paint the picture. The interviews were to be carried out mostly at colleges of further education, but some were carried out at their place of work. In both cases, the researcher had the opportunity to talk/discuss with associates of the student so that again it was possible to ensure true validity of the data gained, both in the questionnaire and interview. Care was always taken to ensure that confidentiality was never compromised.

The programme of using postal questionnaires was continued until the point when it was felt that no further information could be gained from this type of survey, ie saturation point.

It should, at this stage, be pointed out that when dealing with information gained from the Weymouth students, extra care must be taken as the researcher has had prior contact with them in the form of teaching. However, the total amount of contact has only been one hour and fifty minutes per week. What is more, in all cases, the students are confident, conscientious individuals who have a mature attitude and outlook on life and, as such, are capable of giving an honest, unbiased opinion which will not be influenced by the prior (albeit small) amount of contact. With this in mind it would be inappropriate to disregard their experience and opinions which should be viewed as valid.

The students involved in the case studies are identified by their Christian names only. Although some of the girls came from the same college, their institutions are not named. All colleges referred to in the case studies are situated in the west and south-west of England. This made all students easily accessible and able to be monitored/observed without incurring too much expense or inconvenience to either the study or working commitment of the students, employers and researchers. In the case of the part time students there is also ease of access to their places of work, if for any reason it becomes necessary to visit the students and observe them working or to interview the employer/employees.

The majority of girls filled out a postal questionnaire before they were interviewed. Only in the very first case studies were the girls interviewed without any questionnaires being filled in. The design and

construction of the postal questionnaires were based on the answers and experiences obtained from these girls.

Another factor affecting the selection of suitable case studies was that it was envisaged that within a short period of time there would be a dramatic change in the number of colleges of further education offering Motor Vehicle courses. To date, several smaller and medium sized Motor Vehicle sectors/departments are in the process of being reviewed and closed down, and the staff made redundant. This situation has come about due to a long history of poor or inadequate funding which has now resulted in many colleges not being able to raise the necessary capital to meet 'future' conditions.

It is 'expected' that colleges with large Motor Vehicle sectors/departments and subsequent greater funding will be adequately equipped to meet the stringent requirements laid down by the MITSL (The Motor Industry Training Standards Council) and also the local TECs which jointly have the power to award (or revoke) approval to a college to run NVQ courses. The requirements laid down include the provision that training establishments must have sufficient vehicles that are equipped with modern technology. This basically means that vehicles used for students to be trained and tested on must be in most cases no older than five years.

The expense incurred in obtaining just six cars (which would be just enough for a group of 15 students) for the students to work on would be out of the reach of many colleges. Furthermore, sufficient workshop space is also required to allow test vehicles to be positioned out of sight of all students other than those students being tested and the necessary equipment to carry out these tests cannot be met by a large number of colleges.

Therefore with this threat of a rapidly diminishing number of colleges offering Motor Vehicle courses care must be taken when selecting the case studies for this research. It is important to select colleges that will meet all the requirements laid down by MITSC and the TECs and remain in existence as it would be disappointing if the case studies were terminated due to the closure of colleges which the students have no control over.

The following list shows the courses' mode of attendance and year group in which each interviewee was studying:

Name	Mode of Attendance	Course	Year
Kim	Production Engineering Craft Studies	Part time	4th
Pam	Production Engineering Craft Studies	Full time	1st
Lucy	Production Engineering Craft Studies	Full time	1st
Rachael D	Motor Vehicle Craft Studies	Full/part time	3rd
Shelley	Engineering/Electronics BTEC*	Full/part time	3rd
Hannah	Engineering BTEC	Full/part time	3rd
Abbie	School Link	Part time	-
Rachel L	Motor Vehicle Craft Studies	Part time	2nd
Tammy	Motor Vehicle Craft Studies	Full/part time	3rd
Teresa	Motor Vehicle Craft Studies**	Full time	2nd
Claire	Motor Vehicle BTEC	Part time	3rd
Dawn	Motor Vehicle Craft Studies	Full time	2nd

It should be pointed out that the course marked with a single asterisk combined mechanical production engineering with electrical engineering. The course marked with two asterisks was a combination of two separate courses - City & Guilds 3300 Level II NVQ in Motor Vehicle Engineering and City & Guilds 228 Craft Studies in Production Engineering (see Appendix 2b).

Where mode of attendance is shown as full/part time, this indicates that the student spent the first year of the course attending college full time and the remaining years as a part time student, ie attending college one day and remaining at work for four days. This type of student has experience of both life within the confines of college and life at work.

The courses attended by the twelve interviewees can be broken down as follows:

Course Title	**No of Interviewees**	**Percentage**
Engineering Craft Studies	3	25
Engineering/Electronics BTEC	1	8
Motor Vehicle Craft Studies	5	42
Motor Vehicle BTEC	1	8
Motor Vehicle School Link	1	8
Engineering BTEC	1	8

The students involved in the case studies cover all possible four years of training (motor vehicle courses usually take three years and engineering and engineering/electronics take up to four years, particularly if CNC and CAD courses are included).

Some of the girls interviewed had very little to offer in terms of this research as they had faced no hostility, prejudice or extended periods of 'mickey-taking'. For example, Lucy's interview revealed that she had chosen her work placement whilst at school and her careers teacher had encouraged her to take up engineering. Another of her teachers had arranged her placement at a naval base where she encountered no hostility. On leaving school she enrolled on a full time engineering course at her local college where again, apart from the initial friendly jibes which all students are subjected to, she faced no problems in completing the course and gaining her BTEC National in Engineering. She then found employment in a local electrical engineering company. Both of her parents were supportive throughout her training and actively encouraged her in her career choice. In effect, Lucy's experiences and the support offered to her clearly illustrates the ideals of the model proposed in Chapter 3 (see Figure 7, p 62), where each student needs the three main pillars of support to allow them to succeed and go on to become skilled engineers. In essence, she was no different from many of the other girls who took part in this research; she attended similar lessons including workshop practice, she was the only girl in a group of 14 boys. The only major difference was that she had support from the very outset of her career which resulted in her finding full time employment and successfully completing her college course. This experience is also repeated by Shelley who again had support from the very outset of her career, gained full time employment, gained her BTEC National in Electrical/Mechanical Engineering, and was being sponsored by her company to go on to university where she would study for a BEng degree.

These sorts of positive experiences are those which anyone should expect when entering engineering. However, the overwhelming majority of the case studies revealed that experiences such as these were not typical. I therefore eliminated these case studies and concentrated only on those which had relevant and usable information, ie those involving students who had been affected by either supportive or non-supportive action from parents, employers and teaching staff.

Some of the relevant information referred to in the previous paragraph was small such as with Kim who was discouraged from taking a traditional boys course whilst at school and then discriminated against by a local training agency when she was looking for a work placement. In other cases, such as with Tammy, the information was more significant in that she was placed in the parts department when she wanted to be in the workshop. Her problems were increased by a lack of support from her training agency and an over-zealous father who invited friends, neighbours, relatives and anyone else who needed their cars repaired to bring them to his mechanic daughter.

Each of the girls involved in the case studies has been instrumental in bringing to the fore experiences which others may share, from Lucy and Shelley in their ideal situations at one end of the scale, to Tammy at the other.

DAWN

Dawn attended a comprehensive school where she obtained passes in the following five GCSE subjects:

Mathematics	E
English Language	E
English Literature	E
Science	E
Drama	C

Before leaving school, Dawn would go on Saturdays to work with her father who was employed as a panel beater/sprayer. Dawn would help prepare the vehicles and then help to finish them off by removing the masking tape from the windows and other areas once the vehicles had been sprayed. Dawn, therefore, developed a reasonably good idea of what was involved with garage work. When it was time for her to decide on a career, she had no hesitation in selecting motor vehicle mechanics as the area in which she wished to become trained so that she could then join the Automobile Association (AA) as a mechanic (her ambition since the age of 9).

Whilst at school, Dawn had sought no careers advice from any of her careers advisers or teachers and was offered none. The only person she approached for advice was a garage owner who was known by the family. He advised her to go to college and obtain as many motor vehicle qualifications as possible.

Dawn's mother was very supportive and said she would help in any way she could. Dawn and her mother attended college enrolment interviews together and discussed the pros and cons of each college visited. By contrast, however, her father was opposed to his daughter entering engineering - an attitude which he conveyed to his colleagues, who then subjected her to ridicule and taunts such as 'A woman's place is in the home' and 'Engineering is a man's job'. Despite this, Dawn still insisted on becoming an engineer.

On one occasion, a customer was booking his vehicle into the garage for some work to be carried out. Whilst waiting for the booking process to be completed, he happened to see Dawn in the workshop. Turning to the garage proprietor and within Dawn's earshot he said: "What the hell have you got a girl in the workshop for? I don't want her touching my car. She'll stuff it up." At this, the proprietor who had seen Dawn close by and within earshot, invited her over to answer his comments. This she did quite forcefully, stating that she may not have the physical strength of a man, but would probably give more care and attention to the problem and would overcome any strength problems. As a result of this discussion he capitulated and left his car to be repaired. On returning at the end of the day he was very pleased with the work Dawn had carried out and told her so. Whenever he saw Dawn in town afterwards, he would enquire how she was getting on at college and show genuine interest.

Dawn's father has now changed his attitude towards her choice of career and is willing to help her with her college coursework.

On leaving school, Dawn enrolled onto a full time motor vehicle craft course at her local college. There was another girl in her group who did not want to take part in this research. Dawn had no problems with the 'lads' in the group apart from the 'mickey-taking' in the initial settling in period, eg being asked if she was on the right course. A short-shrift reply resulted in the boys never asking the question again.

However, Dawn encountered problems with a lecturer who, during a workshop session made it quite clear that he did not want girls in his group. He turned directly to them and stated that if he was in charge of recruitment he would not allow any girls onto any engineering courses. When Dawn and Clare (the other girl) challenged him on his comments, he retorted 'You females shouldn't answer me back.' (The experiences cited by Dawn were supported by Rachel L, a girl enrolled on the same motor vehicle course on a part time basis.) Dawn said that the boys in the class were aware of the lecturer's attitude and were not happy with it.

On one occasion, both girls sat down with the lecturer and tried to discuss the situation, but they were unable to discover any satisfactory reason for his negative attitude towards them. Finally, the girls approached the head of department who took steps to remedy the situation. The lecturer left the college soon afterwards.

During this period, both girls had considered leaving the course, and would have done so had they not received support from the head of department. This was not the only support that the head of department was to give Dawn. During the course Dawn had trouble at home which not only affected her coursework, but also caused her to self-mutilate. In view of this, the head of department arranged for a student counsellor to discuss the problem with Dawn. The problems at home eventually subsided, and Dawn no longer requires counselling.

To summarise Dawn, she is a keen, competent student who has a high degree of ability in mechanical engineering. This had been confirmed by the head of department and the owners of the garages in which she has worked. During her part time work, the employer has, on occasion, left Dawn alone to carry out repairs and deal with enquiries.

CLAIRE

Claire was aged 18 years at the time of interviewing and had attended a secondary school where she gained the following qualifications and grades:

English Literature	D
English Language	D
Oral Communication	2
Mathematics	C
Science	C/D
Art & Design	C

Claire had also spent the previous year at college where she had gained a Level 1 City & Guilds Motor Vehicle Craft Studies qualification (383/1) and was now part way through her second year. Claire decided to become an engineer at approximately the age of 12/13. When it came to the time of arranging work placements, her teachers and careers advisers were helpful and arranged a suitable work placement for her. They also helped by discussing the advice she had been offered and by advising her of sources from which she could obtain information. Claire's parents were also very supportive and helped to disseminate the wealth of information and advice on offer.

In her first year, Claire had been subjected to some 'mickey-taking' about the way she approached her work. Claire herself said she approached jobs differently compared to the boys, and made the point that the remarks made were non-sexist and were simply a means of getting to know each other. During this unsettling period she did not approach the lecturers but took it out on her parents who would sit down and discuss the problems with her. In Claire's words, 'It helped to tell someone and discuss them'.

To sum up, Claire is a down to earth girl who has a clear idea of where she wants to go. When she was asked if she had received any discrimination from her employer, her simple answer was, 'Everyone wears overalls and boots - there's no difference'.

RACHEL L

Rachel attended her local school where she obtained GCSEs in:

English Language	B
English Literature	B
Mathematics	D

She cannot remember any other subjects or grades although she knows she did not sit a Science examination. Rachel is at present attending college on a day release basis in her second year, studying for the City & Guilds Motor Vehicle Craft Studies 383 Level II examination. She drifted into becoming an engineer after leaving school.

Rachel would help her ex-boyfriend to repair and sell cars and this caught her interest, so she decided that this is what she would like to do for a career.

Her mother was a little unsure at first but has now accepted that this is the career for Rachel. Rachel's mother gives the reason why Rachel had chosen engineering as a career as being a way for her to immerse herself into a male-dominated environment to make up for not having a father's influence whilst growing up at home. Rachel does not see this herself. She says she does it because she likes it.

Rachel did not seek, nor was she given, any careers advice whilst at school. She made the comment that if she had have told her careers teacher that she wanted to become an engineer he would have laughed at her.

Rachel found her own work placement by approaching a garage owner on the off-chance. She was originally placed with an older mechanic who showed and explained things to her. The other mechanics at first kept their distance but now they mix freely with her. Now they do not view her as a girl but as an apprentice with all its ups and downs which includes being thrown into a rubbish skip and being threatened with being thrown into a water butt. Anyone who has served an apprenticeship in a garage will no doubt have been subjected to similar initiation treatments by the other mechanics who might feel that the apprentice is becoming too 'lippy'.

On completion of her course, Rachel has been offered a full time job with the garage, being placed in the motor vehicle repair workshop. The present trend for training within engineering is that the student is taken in by a training agency which finds a work placement in a garage that is willing to carry out training, as well as allowing the student to attend college on a day release scheme. In this way the student gains practical experience in the garage and theoretical experience at college.

Rachel's employer is supportive of her and has arranged her training within the garage to encompass all departments including Parts, Reception, Mechanical and Body Repair Workshops in order that she gets as wide an experience as possible of the motor trade. Her personal view originally of her employer was that he was a penny pincher, but now she changed this view when she was given a pay rise.

At college, Rachel says she has no problems but she does say that on the first day she was very self-conscious and thought that the boys were all staring at her when she walked into the room for the first time. She was able to recognise some male students who she knew so she joined them (she was the only female within the group).

If she had not had recognised anyone, she feels she would not have stayed. The other boys avoided her like the plague to begin with, but now she says 'we all get on with each other. If anyone winds me up I let fly at them and they don't do it again.

As to the lecturers at college, she said that with only one exception all lecturers treated her in exactly the same way as the boys. The exception she felt had a problem with girls in engineering. She explains that he was always 'funny' towards her (his attitude) - he did not want girls in engineering. (Her experiences coincide with those of Dawn.) When asked if she had to become one of the boys to be accepted, without hesitation she says no, she feels she has retained all of her feminism.

Rachel is a confident, happy-go-lucky type of girl who has a short temper. She takes a long term view rather than short term, and one would say she is fairly worldly wise with strong opinions on many things such as abortion, animal welfare and the environment.

TERESA

Teresa attended a comprehensive school where she attained GCSEs in:

Mathematics	E
English Language/Literature	D
PE	D

She also sat for her science examination. However, because of a mix-up with times and dates, she only sat the first paper. Her expected grade for this subject had been D.

Teresa left no-one in any doubt about what she wanted to do when she left school - a motor mechanic. In fact, because of her obsession with VW Beetles, she was often called 'Miss VW' by students and staff alike. So when it came to seeking career advice, Teresa's teachers advised her to go down to the local college. However, when Teresa went to the careers adviser, she was very negative. Teresa wrote that she: " ... put me off the idea a bit. She kept saying that being a girl would make my life hard if I was a motor mechanic". On one occasion when Teresa and her mother attended a careers interview at the school, the adviser continually emphasised how hard it would be and how Teresa

would be subjected to mickey-taking. At the end of the interview, when Teresa and her mother had left the room, Teresa's mother remarked to Teresa that how strange she thought the interviewer was. Teresa herself felt that the adviser was going far beyond the point of highlighting the problems of becoming a motor mechanic. Teresa says that after the interview she felt like a 'plebb'. Teresa visited the adviser on other occasions and each time she would come away wondering whether she should be doing this. In the May of her final year at school, Teresa was interviewed and accepted on motor vehicle course at her local college. However, when it came to start the course in September, she withdrew because of the negative advice given to her by the careers adviser which had undermined her confidence. Instead, Teresa enrolled on a BTEC Sport and Leisure course which had been her second choice. In July, she successfully completed this course and attained the BTEC First Diploma in Sports and Leisure. However, by this time she had grown in confidence and had decided that she would, despite all the negative advice, enrol onto a motor vehicle course which she did and started in September. Because of her change in direction from one course to another, and due to there being no direct progression between courses, there were grant implications. As both courses were full time, the Authority refused her a grant. This would mean that Teresa would not have been able to achieve her ambition of becoming a motor mechanic as her mother, a single parent on a fixed income, would not have been able to afford to send Teresa to college. Both her mother and the college (ie course tutor) put forward a case as to why Teresa should be awarded a grant, the Authority relented and a grant was awarded allowing her to attend the course.

The Motor Vehicle Course

On starting the course, Teresa was the only girl but once the boys had overcome their surprise at having a girl in their midst, they treated her as one of them. She states that she did not feel out of place, but a little bit later in the year another girl joined the group. Neither girl gravitated towards the other. They mixed freely with all members of the group. As far as the expected and established period of 'mickey-taking' was concerned, it only lasted for a short period of time and both girls gave as much as they received. When Teresa was asked the question whether or not she had to become more like a boy to be accepted she laughed and said that she had not. She then went on to say that she did feel more comfortable with boys "as they are easier going and there always seems to be a friendly atmosphere with them. With girls, the atmosphere can be really bitchy. When the boys do make sexist comments, it doesn't bother me but I suppose it may bother other girls".

When Teresa was originally interviewed and she was asked how she was treated by members of the lecturing staff, she gave the answer "They treat us all the same - they give help and assistance to the whole group - no difference". However, 15 months into the course, Teresa started to miss several lessons per week. This situation continued for several weeks. Teresa came in one day and said that she did not want to carry on with the course. When asked why, she gave no reason. It was decided that Teresa and her mother should come in and explore why she wanted to leave. Since Teresa had been the mainstay of the group, this decision to leave came as a shock to the lecturing staff. Teresa had until this time demonstrated a very good knowledge on both practical and theory aspects of the course. When Teresa and her mother came in for the interview, it was established that Teresa was having problems with a lecturer who took her for the mechanical aspects of the course. It was decided

that Teresa should concentrate only on the Motor Vehicle side of the course. Her attendance improved immediately and she did not miss a single lesson except those that had been agreed upon. Teresa completed the course and successfully gained her City & Guilds 383 Level II in Motor Vehicle Engineering.

TAMMY

Whilst at school Tammy gained the following GCSEs:

Mathematics	E
English Literature	E
Science A	E
Science B	E
English Language	F

On leaving, Tammy had not fully decided what she wanted to do so she enrolled onto a careers foundation course which gave her the opportunity to study Electronics, Motor Vehicle, Production Engineering and to improve on her English Language grades. This course is a one-year full time course and is designed to allow the student the opportunity to taste various careers before making a final choice.

Tammy decided to do the one-year taster course because of mixed advice given to her at school. In the final year of school, Tammy sought advice and careers guidance from two teachers (one male, the other female) concerning her thoughts about becoming an engineer. One said: "Yes - go for it", whilst the other (male) said: "No, you haven't got what it takes to become an engineer". However, after the one-year taster, Tammy decided that she did have what it took and contacted a local training agency which interviewed her and carried out various tests to establish her IQ and mechanical aptitude. These tests are carried out on all trainees.

She successfully completed these tests and was placed in a local Peugeot main dealership, where she worked for four days and attended college for one day in order to acquire a City & Guilds 383 Craft Studies qualification. During her interview with the training agency and the garage, Tammy made it very clear that she wanted to be placed in the workshop. She was, however, placed in the stores with the promise that she would be placed in the workshop at some later date. Within a short space of time, Tammy found herself solely running the Parts Department. This involved her serving customers, dealing with cash, stocktaking, ordering and ensuring that all paperwork was kept up to date. At every conceivable opportunity, Tammy would ask to be moved into the workshop. The garage owners would prevaricate, giving reasons such as: "There is no-one to help or show you how things work", or: "There is not enough work in the workshop", etc.

After a while, Tammy and her parents approached both the training agency and the garage to try and get Tammy a place in the workshop. The garage repeated exactly the reasons previously given as to

why Tammy could not be given work in the workshop. (The reason given that there was not enough work was not substantiated by a male mechanic who worked at the same garage.)

The training agency's less than helpful solution to the problem was for Tammy to find another garage willing to take her.

Tammy continued at the garage whilst looking for another placement which eluded all her attempts. Her original garage placement opened an extra small workshop where tyres, exhausts and small mechanical repairs could be carried out without the vehicle entering the main garage workshop (quick fit type workshop). A qualified mechanic and Tammy were placed in the new workshop. Although the work was not too demanding it was part way towards Tammy's ambition of working in the main workshop.

Tammy worked in the tyre and exhaust workshop for four days whilst still attending college one day a week. On some occasions Tammy was asked to work on Saturdays and she was quite happy to do this. Her duties varied but generally they consisted of carrying out repairs to vehicles entering the workshop, eg removing and fitting new tyres to both commercial and passenger vehicles. She was also required to take cash and order new replacement stock when necessary.

During all this time she made it clear that she still wanted to move into the main workshop where the major, more complex problems and repairs were carried out. Tammy was also applying to local garages. One such garage was a local coach company which was run by a female director. When Tammy applied to her for a placement she was told that she did not wish to take her on and gave no reason.

At the time of the third interview, Tammy was unemployed and in negotiation with the training agency as to whether or not she was still on their books (ie out of time). The interview concentrated on establishing why she had left and failed to complete the final year.

The interview established that the information gained during the previous interviews was correct and that she had completed two years of a three-year course and that she had been employed at the work placement for two years (approximately one year in the parts department and one year in the tyre and exhaust workshop). Tammy was then asked what it was that had made her leave. She replied by saying that the mechanic who she worked with in the tyre and exhaust workshop was not 'too keen' on here working there. He would make remarks such as: 'Oh, the girl's doing it', or: 'Don't do this, do that', or: 'I don't want you working down here', and: 'You won't pass your exams'. "Generally he treated me as if I was stupid", she said. (As to her exams, Tammy passed both her second year practical and written examinations. As to her ability, Tammy had successfully completed a short tyre fitting course with a leading tyre fitting company. The examiner informed Tammy that she had the ability and knowledge and that she should do well in the trade.)

As time went by she was asked by the manager and training agency if she was still interested in being a mechanic as she wasn't looking very happy any more. Tammy said that she was still interested and

still wanted to go into the main workshop. Tammy was asked if she felt the employer was giving her support as they seemed interested in her and wanted to know whether she still was happy at her work. She replied: "No, they gave very little support. They just left me to it. There was only one person who has helped me and that is the main workshop foreman. He would sit down with me and explain how things worked."

Tammy was then asked if she felt that the training agency was supportive and helpful. She hesitated for a moment and then said: "No - not really, they failed to keep appointments and if I 'phoned them up with a query or problem they just didn't want to know". Tammy's opinion was that she had to sort out her own problems as they did not want to know.

At college Tammy's work was beginning to be affected by the lack of hands-on experience in her work placement. This fact was reported back to her garage and training agency in the hope that she may be moved into the main workshop. This was all to no avail. Tammy was also beginning to fall behind in some of her course work which was unusual, as normally she was on time with her work which was always neat and tidy. During a discussion between Tammy and her course tutor it transpired that her father, who was overly proud of his daughter becoming a motor mechanic, would invite friends, neighbours, relatives, and anyone else who needed their cars repaired to bring them to his 'mechanic' daughter to repair. This over-zealous pride resulted in her being swamped with work in the evenings and at weekends, so she did not have time for her course work. Her course tutor invited Tammy and her father for interview in order to overcome the problems. Her father was left in no doubt that his over-zealous pride in his daughter and her abilities was commendable. However, he was advised not to over-burden her with motor repair work in the evenings and at weekends.

Tammy was offered extra one-to-one sessions with the lecturers on her course in order to make up for lost time and also to overcome the problems of lack of hands-on experience in the main workshop at her garage placement. She gladly accepted, and took up the offer with open arms.

Tammy left her work placement at the start of her final year due to broken promises, lack of employer and agency support, and generally a feeling of abandonment at her place of work.

As a footnote, Tammy is an active member of a local territorial army group and has worked her way up in the ranks to attain the rank of sergeant. She is the only girl in the detachment.

HANNAH

Before Hannah was interviewed, both her course tutor and employer made her aware that she had experienced some trouble at college. Neither of them actually informed me of the nature of the problem but wished me to be sympathetic when certain areas were being investigated, ie college life.

Hannah, when interviewed, had just started the first year of an HNC course after completing a BTEC National Mechanical Engineering course (a three-year course). Prior to starting college, Hannah had attended a mixed catholic school where she gained he following GCSEs:

CDT	A
Mathematics	B
English Literature	B
English Language	B
Mixed Science	C/D
Home Economics	C

Hannah's choice of career was based on advice given to her by a friend of the family who owned a small engineering firm and also advice given by local engineers who gave talks to the pupils in their final year of school. Hannah's mother was little concerned about her career as she wanted Hannah to stay on at school and gain A levels. Her concerns were eased when a lecturer from the college explained that on completion of the course Hannah would achieve a qualification (BTEC National) which was equivalent to two A levels.

On leaving school, Hannah obtained a full time job with a multinational company as an apprentice mechanical engineer. Her first year of training was to be carried out at her local college which she would attend as a full time student. After this first year she would then attend college on a one day a week basis.

Hannah was asked about college life, in particular whether the staff treated her any differently to others in the group (she was the only girl), and about how she got on with the boys. Her answer to the question about the staff was that "They treat us all the same. There is no form of discrimination between the boys and myself." However, when she was asked to comment on how she got on with the boys in the group, it soon became apparent that there was a problem.

The following section are Hannah's own words taken from the actual interview.

> "At the start of the course (first year full time) I had a lot of problems with several members of the class, but one in particular who incited another two or three students to make rude/sexist or just downright offensive remarks to me or about me. This situation lasted for about three or four months. At first I was able to cope with it and shrug off these comments and ignore them. None of the other students joined in or stuck up for me during this time so I had to deal with it on my own. After three or four months it became too much for me and started getting me down so much that I would go home crying and I was seriously thinking about giving up my job because of the harassment I was receiving at college by these lads. My mum got in touch with the personnel officer and explained the situation. The personnel officer then got in touch with the deputy head of school who did two things. Firstly, he interviewed the whole group to try and ascertain who was involved. He then sorted out the main trouble makers and read them the 'riot act' and warned them that if there was any repeat of this type of behaviour then they would be removed from the course straight away. Secondly, he got in touch with their firms and explained exactly what had been going on and what he had done. The immediate outcome of this was that these three male

students were not allowed to sign their contracts (which they had been due to sign) and they were told that they were being put on to probation. They would only be allowed to sign their contracts when a good report had been received from the deputy head of school.

Question
What was the attitude of the group after this?

Answer
At first no-one spoke to me, but after a little while some of the boys began to speak to me and there was some 'to-ing and fro-ing' asking questions such as "Did you understand that because I didn't" - that sort of thing, or if I had a problem I would ask them and they would help me.

Question
What about now?

Answer
Five of the original group have moved up into the HNC class, so we have been mixed with the 2nd HNCs. Some of the older lads don't talk to me much, but they talk to the lads. If I start talking to them then they will carry on the conversation.

Question
Why do you think they won't open a conversation with you?

Answer
I think they are scared or don't know how to talk to me because they are not used to having a girl in their class. It's like the boy in the first year who caused all the trouble. He came from an all boy school so I think that he just didn't know how to talk to a girl. I used to think it was me who had the problem but now I know it's not just me - it's them, so I don't mind the situation now and I can cope with it.

Question
When you had the problems in the first year why didn't you go to one of the lecturers and tell them what was happening?

Answer
I didn't feel that I could go to any of the lecturers in case they just told me not to be silly and not let it bother me.

Hannah's experiences clearly illustrate the negative effect that pier pressure can have on a vulnerable member of a group.

PAM

Pam started a part time Craft 201 Engineering course at her local college after gaining the following GCSEs and obtaining a job with a local engineering firm:

General Science	C
Art	C
English	E
Mathematics	E

She decided to become an engineer whilst in the fifth year at school when local engineering companies came to the school to show videos and talked about engineering. One firm also invited their first year female apprentice along to discuss engineering with the fifth years, particularly the girls. Pam actually obtained a job with the same firm as the female apprentice (Kim).

Pam's parents both supported her in her career choice. Her father, who owned his own commercial vehicle repair workshop, would discuss with her what she could expect when she was at work.

When Pam first started work she would get help and assistance in setting up the machines from Kim and others within the workshop. As time went by they became less helpful and she began to dislike he work. She also began to wonder if she had made the correct decision.

Pam was also having problems at college. When she was asked to expand further her experiences at college, she said she had mixed feelings. When she first started the course she was very nervous and some of the group questioned her whether or not she actually wanted to do this type of work as this was usually men's work. Apart from this, and a little 'mickey-taking', the start of the course wasn't too arduous. However, as the year progressed the jokes became more vindictive and Pam began to have difficulty handling them. During the interview, she stated that most of the problems were instigated by two boys within the group. One of the boys was later asked to leave the course because of his behaviour and attitude towards Pam. (This was confirmed by her course tutor during an informal discussion after the interview.)

The combination of these problems led Pam to become disillusioned with both work and college. She approached her firm and informed them that she did not want to become an engineer. They in turn offered her a job in the office which she accepted. When she was asked during the interview what her main reason was for giving up the course she replied "It was the frustration at not being able to get on with the work at college because of the boys. By the time I told the lecturers I was already disillusioned". Pam went on to say "If there had been another girl in the group I think I may have stayed. In the beginning I was left alone. It wasn't until later in the year that I was invited to join in, so if there was another girl or so it wouldn't have been so bad. I was pleased that I gained my CNC and practical qualifications in that I tried and succeeded. Thinking about it, I am glad that I have done it and I wouldn't discourage any girl from taking up engineering as a career. However, I think two or three more girls in a group would be essential in order for them to succeed." Pam then went on to say

"My only advice on where I feel I went wrong was not retaliating soon enough. I allowed them (the boys) to go too far before I put my foot down. But I would do it all over again if there was another girl in the group. At the start of the course I did worry about my lack of knowledge, but I soon realised half the boys didn't know anything anyway, but I didn't have the courage to ask questions. So I think I would tell any girl thinking about engineering not to worry about their knowledge and not to be afraid of asking questions as most of the boys would not know the answer anyway."

As a general overview, Pam is a very 'chatty' person who uses this to cover her shy and sensitive nature which may have been a contributing reason as to why she found difficulty in standing up against the boys' 'mickey-taking', and why some of the boys, sensing her vulnerability, became vindictive in their treatment of her.

KIM

Kim was in her fourth (final) year of a Craft Studies Engineering course. She is employed by a local engineering firm, a job which she obtained through a training agency. Once Kim has completed her training, her intention is to join the Royal Navy as a mechanical engineer. She has, in fact, been down to the recruitment office and already had her preliminary medical ready for entry.

Kim was asked to recall her first fear at college. She explained how she initially contacted one training agency which did not want to enter her on to their books, stating that they would find it too difficult to place her with a company. So Kim approached a second training agency which not only accepted her on to their books, but also were able to find, without difficulty, a local company willing to offer her a work placement. Kim explained that when she initially stated, some of the men jokingly said she would only last six weeks, then two months, then three, and then they just gave up and accepted that she would 'stick it out'.

Other than this, Kim was accepted and treated the same as any other apprentice. The question of motherhood was raised when she initially started which at the time annoyed Kim, but now, several years later, she can now understand the reasoning behind the question. As Kim stated: "After all, there is a large cost in training someone so you don't want them to leave soon after. It's easier now for a woman to bring up children ... although there is a change happening where some men stay at home to look after the children. I suppose it needs a change in society".

As for college, when Kim first started, she was subjected to the initial period of 'mickey-taking'. Some boys on the first day asked if she hadn't made a mistake and was in the wrong class. Kim said she was very nervous but she didn't let them see it and she ignored their comments. Kim then explained that her salvation was at the expense of a boy who she described as 'gawkey'. She felt that both she and this gawkey boy were the most likely pair to leave the course. She said: "This boy took a lot of pressure off me and allowed me to become accepted by the group. In fact, I used to join in and take the mickey out of him". The gawkey boy left the course in the second term. As in the previously covered case of Pam, the most vulnerable member of the group is victimised. In this case it was a male rather than female student.

Both Kim's parents were supportive of their daughter's career choice, even when in the beginning she would return home at the end of the working day and would, in her own words: " ... be ratty with them. I thought I would not be able to cope with it all but my parents would support me and say give it six weeks before you make a final decision".

Kim is a very confident, outspoken girl who admits herself will not sit back and let things go if she doesn't understand some aspects of her training. She will ask questions during lessons and is not put off by the boys or the fear of looking stupid in front of others. It is for this reason she feels she has succeeded. She also stated that the attitudes of employers, and groups may deter some women from entering and continuing in engineering.

Kim also explained how schools' attitudes may not help. When she was choosing her options at school she was deterred from taking up technical drawing as they viewed this subject as a boys' subject, and they kept on emphasising the fact that she would be the only girl in the group. Kim decided to drop this subject for a more 'acceptable' option.

TO SUMMARISE

The evidence gathered and described in this and the previous chapters clearly illustrates the need for the support demonstrated in Figure 7, p 62. For example, Lucy's experiences were all positive in that she had the three pillars of support, ie parental, educational and employer, and when all of these pillars were combined, she was able to successfully complete her course and obtain a full time job within engineering.

Both Lucy and Pam also illustrated the strength of role models as a recruitment aid. Both the girls attended the same school and were in the same year, but not in the same class. They both independently decided to enrol onto an engineering course after their school had been visited by a young female engineer (Kim) who explained what engineering was and what she had gained from becoming an engineer.

On the other side of the coin was Pam who failed to obtain educational support due to her not confiding in the lecturing staff which subsequently led to her leaving the course prematurely. During her interview she stated that the one main contributory factor for her failure was lack of confidence to deal with the mickey-taking of the boys which could have been avoided if she had confronted the problem earlier by talking to her lecturers and being more confident in the group. Also, her lack of ability at work was making her ask the question whether she had chosen the right career. This fact again points to her not feeling confident enough at college to ask questions and ask the same question again if she was still unsure in case she was thought of by her peers as being stupid. Pam, during her interview, stated that she felt nervous in the class whenever she did ask questions in case she was laughed at. With more confidence to ask questions at college where there is sufficient time to answer, no doubt this would have helped her at work and she possibly would not have been asking herself whether she had chosen the right career. These findings must be taken into consideration when planning any future training programmes.

Chapter 6

Chapter 6

CONCLUSION

The information gained separately from the surveys carried out by Valbjorn & Hansen (1992) and Bloeme & Van Der Craats (1992) were, in general, very similar. This pointed to a series of seemingly obvious guidelines which should be incorporated in any course planning to help reduce the high dropout rate and change the traditional patterns of vocational choices. The information covered the full range of the course planning from recruitment to its completion, from when the students begin to think about becoming an engineer, their plans when they complete the course, and their experiences during the course itself. Many of the findings and subsequently some of the recommendations are substantiated by others such as Valbjorn, Hansen, and Chivers et al. It is safe to say that there is no one set thing that distinguishes these girls who fail to complete from those who succeed. They all have a high factor of motivation and commitment at the start. The following is a list of observations made as a result of this research.

- The majority of young women who chose engineering did so when they were choosing their options at school, ie 14 years of age, whereas the majority of young men chose engineering in their last year of school. This early decision by the girls should have influenced their course options whilst at school, however, in many cases the girls were prevented or discouraged from taking up traditional boys' subjects. Taking traditional boys' subjects would help to equip and prepare girls for their future careers in engineering. This could go some way to eliminate some of the concerns voiced by the girls who took part in this research of not knowing anything about engineering (see p 90). This point is illustrated by the case of Kim (see p 113) who wanted to study technical drawing but was prevented from doing so. Engineering relies heavily on graphical communication, so being able to interpret engineering drawings would have gone a long way towards helping her to understand various aspects of engineering and how components work and are assembled.

- From Table 18 (p 86) it can be seen that female engineers put a great deal more thought into their career choice and take a longer term view of job prospects, eg planning and going into management, owning their own companies, or progressing into higher education. Male engineers do not seem to plan too far ahead and concentrate only on passing their exams and becoming qualified. For the majority of girls and boys who took part in this research, their decisions were influenced by their fathers' occupations (p 88). This demonstrates the powerful effect that parents have on their children's decisions. Another influence on the boys' choice was their experience gained whilst on work placement. This type of experience was not available to many girls, but those who were lucky enough to gain a work placement within an engineering environment enjoyed and gained a good insight into engineering which provided a good basis to build upon. This opportunity was not made widely available to all girls and it only depended upon the attitude and encouragement offered by the girls' tutors and careers advisers. As to the issue of attitude, understandably most of the girls' parents were a

little apprehensive of their daughters entering a trade or profession which is still perceived by society as a trade fit only for men (see p 29). However, this apprehension soon changed once their daughters started their courses and a career route was identified. In the case of the boys, most parents were pleased with their sons' choice from the very outset.

- Some of the largest hurdles to be overcome for young women engineering students are at the beginning of their career. Entering a classroom which is full of boys is nerve-wracking and if she was not determined at this stage she would very easily falter and fail to even start the course. Of those who do not even reach the start of the course, many regretted it later (eg Teresa, p 105). Teresa was extremely determined to become a mechanic but was convinced by her teachers that this was not the right thing for her to do. The result was that she wasted a year, but then, after completing a BTEC course in Leisure and Sports, she then enrolled onto a motor vehicle course which she successfully completed. However, there have been many who I have come into contact with during this research who did not enrol onto an engineering course because of similar advice as that given to Teresa and have later regretted it. This suggests that the girls who do enter engineering are, from the very outset, highly committed and deeply motivated to overcoming the initial problems of actually going against long-standing career trends and negative advice. As to the question of advice, careers advisers and teachers, many did not give well balanced and informative information to those students who sought advice from them. Comments, such as 'engineering is no job for a woman' and 'have you considered nursing or hairdressing' are not uncommon. Authors, such as O'Donnell (1992, p 29) also perpetuate this idea that engineering is not a career for women. The answer to the question 'how many of these advisers and sociologists have an understanding of modern engineering' begs to be answered, as it is these people who have a great influence on the careers and expectations of school leavers. The advice given to school leavers is an example of how the social barrier of attitude is prevalent in those who are supposedly independent and should give balanced advice.

Once the girls have entered college life and overcome the initial trauma of being possibly the only girl within a group, and the inevitable mickey-taking period (which as a general rule would seem to last only for the first term with one or two exceptions - Hannah, p 109; Pam, p 112) and they have been accepted by the group, then the treatment by their peers is generally the same for both genders. This period is, as several of those interviewed said, a get-to-know-you period, where individuals are vying for position within the group (see Kim, p 113). One thing that was made apparent was that to survive this period it is necessary to retaliate early and not let things build up (give as much as you get). For examples of this see Pam (p 112), Kim (p 113) and Dawn (p 101). Although retaliation was necessary to survive, none of the girls interviewed felt that they had to become a boy. They all felt that they kept their femininity.

- The preferences as to which mode of attendance was preferred by male and female students differed greatly. The majority of female students who completed the questionnaire stated that they would prefer to attend college on a full time basis, whereas the boys would prefer to attend on a part time basis giving reasons such as 'I couldn't stick being in a class every day'.

Of the girls interviewed there was a fairly even split concerning the mode of attendance. Reasons given for attending full time were that it gave them time to gain knowledge and experience in a protected, caring, non-hostile environment before they had to go out into full time employment where they would be expected to cope with the pressures of work and any possible hostility and prejudice from work colleagues and customers (eg Dawn, p 101). As one girl stated: "We are expected to put in 110% where every little thing that we get wrong will be magnified into something big". Those girls who were in favour of part time attendance cited reasons similar to that given by the boys, but they also stated that they had to mix with the men sooner or later so they might as well start as they meant to go on. Both views have pros and cons and will depend on the individual's own character and personality.

- The general consensus of opinion by the girls who took part in this research felt that there should, if at all possible. be more than one female in the group. By having more than one female within the group they would be able to offer each other moral support, particularly in the first term during the mickey-taking period. This would also, give them support when they needed to ask questions in class but did not wish to show themselves up by asking what they felt were simple questions that they should know the answers to. This is one main concern which had been voiced by many of the girls interviewed. They stated that they felt nervous when asking what, to them, seemed to be basic questions and showed the rest of the group, ie the boys, the lack of knowledge that they had. One interviewee, Pam, who did not complete her course, stated that if there had been one other girl in the group, she felt she would have stayed and completed her course (p 112). It should be stated though that most of the girls interviewed were the only female members of the group and these girls for the most part were the ones who during the mickey-taking period stood up for themselves and did not allow the boys to get the better of them. This suggests that some girls who are not confident either about themselves or being around boys, may need the extra support of females within their groups. In the case of Hannah (p 109) it was only through the joint support of parents, employer and college staff which prevented her from leaving when she was subjected to a pronounced mickey-taking period. Hannah's experience clearly demonstrates the importance of the three pillars of support which I suggest as being necessary to successfully complete her course.

- As to the question of whether or not a female lecturer would be of benefit to female students studying engineering, the boys felt that it would be beneficial. However, there was only a narrow percentage of girls who felt that a female lecturer would be beneficial. The reasons given by those girls who did not feel it would be beneficial ranged from 'the boys would not take them seriously' to 'I prefer to be taught by male teachers rather than female teachers as I get on better with them'. A common comment made by both genders was that it did not matter whether the lecturer is male or female - what really mattered was that they knew their subject. All felt it would be wrong to just give a woman the job to the detriment of the subject, ie following a positive discrimination policy and not selecting the best person for the job itself. As to whether the students, both male and female, could approach the lecturing staff with either personal or academic problems, many stated that they could approach the staff. One or

two did, however, feel that they could not approach the staff with personal problems but were happy to discuss academic ones. During the interviews, several of the girls stated that they had in fact approached lecturing staff to discuss personal problems. One such student was self-mutilating whenever she became depressed. She informed one of the lecturers of this problem who in turn contacted student guidance and between them arranged counselling sessions to help her overcome this problem. This is not an isolated case. Staff have been asked to help students who have had a wide range of problems including drug addiction, family break-ups and criminal activities. So it is clear that the staff may have a large effect on the student's life, not only whilst in college but outside. As such they are in a position of trust and support when it is required, even though the majority are male with only a small percentage of female students.

- A clear majority of male and female students who answered the question concerning segregated groups overwhelmingly said they would prefer not to go into a segregated group. This observation is also supported by research carried out by IRIS in 1992. This finding was surprising as it would have been expected that the girls would have wanted to go into an all-girl group rather than go into a heavily biased group of boys. When the reasons given are examined, they show a more enlightened view taken by both groups. The main reason expressed by the girls was 'we have to mix with the boys in industry, therefore we might as well mix with them from the very start so that we can get used to them and they to us.' This reason is very similar to that expressed concerning modes of attendance. From this it would be fair to say that both gender groups realise the importance of social interaction between the genders within workplace and classroom and that this interaction must be from the very beginning of their careers. Both gender groups also realise the need to get used to each other and therefore gain acceptance and recognition of their skills. This is particularly important for female student engineers.

- Employers have been shown as a source of support (Hannah, p 109; Dawn, p 101) but as with any group there are exceptions such as in the case of Tammy (p 107) where they were a source of hindrance and not support as in the case of many of the girls who were interviewed. Although the employers of the girls interviewed were a source of support it must be remembered that these people are the ones who were willing in the first place to give a young, inexperienced female school leaver a job and these people are very small in number. It would therefore be expected that this group of employers would be willing to offer support when it was necessary. For every one supportive employer, there are many employers who would not consider taking a girl on to work in the workshops. This is illustrated by the case of a local coach hire and repair firm whose owner was approached by one of the girls interviewed. The girl was told in no uncertain terms that this company would never entertain the thought of employing a female mechanic within their workshop. This is not an uncommon situation and is the view taken by many garage owners. However, what is surprising is that the owner of this coach firm is a woman. Emphasis must be placed on encouraging more employers to give young female engineering students the opportunity to find employment within their workshops or some way of providing work experience for this group of students. Not only

employers need to be encouraged to take young girls on as training mechanics, but also training agencies need to be encouraged to take girls on and place them in work placements. There are many training agencies which are providing training for male engineers but actively discriminate against girls and are unwilling to take these girls on. There are others which will take them on, place them in a garage or workshop but then are unwilling to give support when the trainee requires it (Tammy, p 107). On the positive side, those employers which are willing and have taken on young female engineers are generally impressed by the standard of work carried out by these girls and are willing to offer them a full time job after their training.

- Parents' attitude is positive where their sons take up engineering as a career, but when it came to daughters selecting engineering as a career, their parents were understandably apprehensive because of society's attitude. Their main concerns were that they did not know where their daughters were likely to progress to (career path) - they may not get a job, the mickey-taking and abuse that their daughters might be subjected to during their training. Once their daughters had started and for most successfully negotiated the first term, ie the mickey-taking, getting-to-know-you traditional period, then the parents became more at ease. During the first term, parental support was evident and commented upon by many of the girls interviewed. These girls particularly stressed the importance of this support (Hannah, p 109). Parents may also be a unique source of hindrance when, as in the case of Tammy (p 107), where her father was over-zealous in his support. Tammy's father was overly proud of his daughter and placed her under undue pressure which affected her studies and almost caused her to drop out and not complete the course. This type of pressure is rare but it does show that there are no clear, well-defined barriers which affect the retention of young female engineers. Instead, there are complex reasons which may affect a young girl and cause her to fail to complete her course.

Chapter 7

Chapter 7

RECOMMENDATIONS

This research was initiated, not only to try and establish the reasons why so many girls fail to complete their engineering courses, but also to incorporate this information into a course designed to overcome these problems. From the findings of this research and that carried out by Valbjorn & Hansen (1992) and others, it is a well-established fact that one of the main requirements of a course is that of support from parents, colleges or schools, and in the case of school leavers entering employment, support from employers. This chapter now concentrates on the manner in which this support could be provided. A course must also incorporate other facets within its structure. These facets include improvement in the status of engineering, particularly at craft levels, increased recruitment and retention, a change in society's attitude towards people undertaking non-traditional employment, the provision of a level playing field for women entering engineering and young people need to be equipped to cope with present-day technology and future technological advancements. All, or as many facets as possible, must be reflected in any proposed new course.

What follows is my hypothesis of how a new course should be devised in order to meet as many of the facets mentioned above, thereby reducing the drop out rate of so many young, female engineering students.

PROPOSED NEW COURSE OVERVIEW

- ***Interim training programme***

  Because of the complexity in planning a course designed to accommodate all the necessary facets, it is necessary to bring into existence an interim programme. This interim training programme would simply consist of a pre-course course funded by the government and run by colleges and other training establishments where fundamental engineering concepts, terminology and identification of components, tools and machinery, could be covered. Any vulnerable prospective female or male engineering student who felt that their situation on the main course would be enhanced by an initial preparatory course could benefit from attending such a course.

  The students will be tested on their technological knowledge. They will be asked to identify simple components and types of tools, eg spark plugs, pistons, ring spanners, sockets, etc. If the students find this test difficult then they will be advised to take up the offer of the pre-course course. The decision as to whether they attend this pre-course course will be at the discretion of the students so that they feel that they are not being discriminated against, whether positively or negatively, that their failure or lack of knowledge is not being highlighted in any way. They themselves must be the ones to choose in order that they will achieve the

maximum benefit. From the research interviews carried out it is apparent that if students were given this opportunity then many of them would have accepted the offer.

This course should be available to students who are planning to attend college either full time or part time and could be run either immediately after the student has finished their compulsory schooling or in August just before the college courses start. If the student is to attend college on a part time course the pre-course course will run in July before the student starts work. In the case of full time students, this course will be run in August before they start college. This would eliminate several of the concerns voiced by the girls when interviewed and my suggestion of such a course was actively supported by several of the girls when the idea was put to them during their interviews. It is interesting that at this moment in time the British army are applying a similar policy of running a pre-course course for their army recruits in order to improve recruitment within this branch of the armed forces.

The interim training programme will only achieve one of the above-mentioned facets required, that of support. What is clearly required is a full, integrated training programme which includes all facets, including the important three elements of support previously mentioned (parental, educational and employer) and this is where a radical change in training is necessary. The programme suggested below is similar to that which is used in Germany, America, and a number of others, and incorporates aspects of policies used in Holland and Denmark.

- ***Include all gender groups***

To ensure that the girls are allowed to compete on a level playing field any training initiative should include both gender groups. At present, in America, a positive discrimination policy is being operated to try to increase the numbers of African-Americans and Latinos, and other minority groups, to enter universities. This policy has been running for the past 10 years and has resulted in an increase of these minorities entering USA universities. In California, however, there is now a backlash against this positive discrimination which is being co-ordinated by a black African-American senator who claims that this policy is undermining the African-American and other minorities' self-esteem. In his view it is not allowing them to compete on an equal footing and is degrading them by allowing them to achieve by lowering the entry standards for this minority group. This feeling is now spreading throughout America which may result in a general feeling of disillusionment about methods of positive discrimination.

The circumstances being faced in America highlight the problems that any positive discrimination could face in Britain. Therefore, it is important that the training programme for student engineers must be equal for both genders. This view has been echoed by those interviewed. They say that there should not be any difference in the way that any course is presented. Comments such as: 'We all put our overalls and boots on in the same way - no difference' and 'We have to work with the boys later so we might as well start as we mean to

go on' highlight the fact that they are against any form of positive discrimination. Furthermore, the lack of support for segregated classes by both male and female students again reinforces the principle that both genders should be treated in the same way, and both given equal consideration and opportunity.

- ***Routes***

Traditionally, a school-leaver will take one of two routes into employment. They will either become employed and attend college on a part time basis or they will go into full time education. I suggest that instead of taking either one of these two traditional routes, all school-leavers wishing to embark on a career in engineering (at any level) will enter college full time and undergo training before they enter the world of work. If we take, for example, a person who wishes to become a nurse, they do not finish school on the Friday and the following Monday put on a nurse's uniform and start working in a ward in a hospital. Instead they enter a training school where they undergo a significant period of initial training to gain a firm understanding of their duties and issues relating to the care of sick people. They will go into a ward for a period of time before returning back to the school for further theoretical studies. I suggest that all engineering students should undergo an initial period of training within colleges lasting approximately 6 to 10 weeks before being placed in a work placement. To complete the full integrated training programme, the student will have completed a 2 to 3 year training programme designed to incorporate as wide a range of work experiences as possible. The trainee will have been placed in industry for defined periods in order that the theory and practice gained in college can be consolidated by practical experience within the work placement.

This new initiative has the advantage over the current full time courses where the only work experience the student can gain is within the college's own limited resources, thereby only offering the student is stifled, simulated work experience. It also has the advantage over part time training in that it offers the vulnerable student the support of the staff of the educational establishment who usually have a caring, protective attitude towards their students. The three levels of support identified earlier as being essential for effective all-round support will also be achieved. An in-depth outline of this proposed new initiative is given below.

FULL INTEGRATED TRAINING PROGRAMME

When this initiative is initially implemented, school-leavers will enter compulsory FE training where they will undergo a period of 2 to 3 years of integrated training before becoming eligible for full time employment. Within this period of integrated training the trainee will gain work experience in several companies in order to obtain as wide a work experience as possible. This is necessary as not all employers have the same types of equipment or working methods. If we take for example engineering, many engineering firms do not have or use modern machining equipment such as CNC machines. In the case of motor vehicle workshops, again many of the garages do not have the electrical electronic testing equipment necessary to diagnose and repair faults within a motor vehicle's

electronic system. By allowing the student to experience as wide a field as possible, they are equipped with a broader knowledge of the industry as a whole. The college will also be in a position to offer a student the theory and the knowledge of the new technological advances that are being made within the industry. Again, if we take a vehicle's electrical electronics, many of the garages do not have the equipment or the expertise to use such equipment to pass on to any trainee within their establishment. A student undergoing the full integrated training programme would obtain not only the basic skills necessary, but also the new advanced skills required for engineering in the future.

Why should industry now provide placements for these students when in the past it has been so reluctant to do so? The answer is quite simple, for the first 2 years of the new initiative, industry will have no new intake whilst the students are studying full time. Industry therefore will be more willing to offer placements in the hope that they will be able to identify a suitable future employee once they have qualified. Responsibility for the training would be undertaken wholly by the colleges and not by the firms themselves. It has been recognised by employers for many years that for the first eighteen months of any new, inexperienced trainee joining a company, they will have a deficit effect on a company's income as it is necessary for them to work with trained staff, slowing their work rate down. They also incur costs to the company's finances in terms of mistakes made from inexperience. With the colleges now taking total responsibility for training, this will save industry the expense in time and money. Industry will only be gaining trainees who have gained a basic knowledge and some experience at the start and a workforce which is equipped to deal with today's technology and future technology. The colleges would act like brokers placing the student with employers and monitoring their progress. Employers would be encouraged to take on both genders as colleges would be acting as referees for these students. This system would ensure that all individuals, regardless of their gender, were placed with employers who matched their personal attributes.

The design of the integrated training programme will incorporate the needs for industry, both large and small companies. This will be achieved through the work experience provision as all companies will be encouraged to participate whether they are large multinationals such as Fords, or the small independent which employs one or two people. These companies will be able to direct the colleges to their needs and the needs of the students, which will vary from one company to another. By doing this, the students will gain knowledge and experience in all types and sizes of companies and recruitment to these companies will be the spur to encourage the student to work and gain their qualifications and grades.

I outlined how industry would play its part in this new course initiative, firstly as they are possibly the largest hurdle that must be overcome, particularly when it comes to placing female engineers into work placements (see p 55). This problem was also highlighted recently in an issue of the FE Now! newspaper which was mentioned earlier in Chapter 4 (p 97). The problem of work placements and final full employment is the greatest problem that has to be overcome. However, it is not insurmountable as demonstrated by the experiences of INNOVAM in Holland.

As to the problems of parental and educational support, these are not so problematic. In the case of parents, many of them only had misgivings at the start of the course and in the majority of cases these

misgivings were dispelled once the parents had been informed of such things as career routes, employment, etc. Being made aware of the options open to the students, allowed the parents to become more at ease and supportive of the career choice that their children, particularly female, had decided upon. Therefore, what I am suggesting is that the parents of prospective engineering students, both male and female, should play a more active role in the training of their children. This would not mean just being invited to attend a parents evening where a child's work and progress on the course would be discussed. The parents could become involved in such things as arranging work placements, attending course planning meetings between colleges and employers, and attending talks given by local employers, engineering lead bodies, educational award bodies and careers representatives. This would develop parents' understanding of engineering and what their children could gain from becoming an engineer.

A similar idea to this was successfully carried out in Denmark, however, their scheme only actively involved educational establishments, careers representatives and parents. Employers were, to some extent, left out. It was only the careers advisers who represented the employers' viewpoint. This is unsatisfactory as the careers advisers could not represent accurately the viewpoint of ***all*** employers and this was clearly illustrated when it came to trying to find placements for the engineering students.

As far as educational support is concerned, this is already in place. The only major change for colleges would be the overseeing of work placements and the greater involvement of local employers and parents in the planning and running of courses. However, on making this point, some colleges have in existence employer liaison committees which meet regularly to discuss various training/employment topics. These liaison committees are, however, not the norm in the majority of FE colleges, but there is no reason why they should not be more actively encouraged. In fact, in a government consultation document entitled Targets for Our Future (1997), the government are targeting employers to become more involved in the training of young people. Colleges will have to take on the role of being employer brokers in order to ensure equality of training and prevent any form of discrimination both from within their own and employers' establishments. The emphasis clearly needs to be placed on employers as they are the area in which the final pillar is missing.

As I stated at the start of this chapter, the proposed integrated scheme is not necessarily new but is a compilation of many other schemes which are at present being used in other countries. In Germany, the school leavers enter engineering training schools where they spend one week in school learning the theory and 2 weeks in the school's workshops putting the theory into practice. This is a very expensive method of training as the school needs to equip the workshop with vehicles and equipment. Local German garages do support these training establishments by sending problematic vehicles to the school where they are diagnosed and repaired. The German equivalent to the UK's MOT Inspectorate use the workshops once a month to carry out vehicle inspections. What I am suggesting is more involvement by UK industries in the training of all trainees and not just their own individual trainees. For this reason the UK government and engineering bodies such as the Engineering Council, must be fully involved in the training of all levels and types of engineer. The government must act as a central co-ordinating body which will help provide the necessary input and funding to ensure the training standards are improved and encourage all industry to actively participate in the training

programme. The government must also provide adequate funding for the courses and a salary for training, paid to the students. The involvement of industry and the engineering bodies, with the government as a central co-ordinating body, will serve to ensure that engineering becomes an attractive and realistically achievable career for both male and female school leavers.

The government must provide a salary for those who are undertaking this training as this is now becoming a major reason why so many students throughout the FE and HE educational systems are dropping out. This salary could be provided to the students through their work experience providers, bearing in mind their ability to pay. Alternatively, it could be provided through a training levy which was in existence several years ago where industry paid a percentage of their profits to a training board. Whatever system is adopted, the people who are actively improving their job prospects should not be penalised for doing so; they should be encouraged and assisted to become fully qualified. Training should be viewed as a necessity and not as an expense.

This integrated training provides other smaller advantages to many diverse organisations and establishments, such as universities. In universities, the first year of many engineering degree courses requires the student to obtain basic engineering skills which could be provided earlier within this integrated programme. This would relieve the universities of this burden and allow them to concentrate their time and energies on the more advanced theoretical work in which they specialise. Those school leavers who wish to become graduate engineers will of course not follow the same course programme as craft engineers, but will follow a more academic programme while still gaining work experience, thereby enhancing their knowledge and manual skills before entering the universities. By involving the engineering bodies and government in the organisation and administration of the course, the status of engineering in society's eyes will be raised. It will be seen as a professional career with well-defined career routes, both for prospective male and female engineers. This will also generate an improved recruitment and distribution of accurate, up-to-date information concerning all aspects of engineering from the lowest operator up to graduate levels. It will equip the future engineering workforce with the necessary information and wide expertise to cope with future technological advancements.

Appendix 1

A sample of the colleges listed by the ECCTIS 2000 CD-Rom programme. This list was used in contacting colleges of further education to establish if they ran engineering and/or motor vehicle courses and whether there were any females enrolled.

ECCTIS 2000 CD-ROM search : Wednesday November 09 1994 at 13:39:04

Search type : Standard subject
Type : Further Education
Method : Any
Institution : College (Higher or Further Ed)
Location : England
First subject : MOTOR VEHICLE MECHANICS

Brief details :-

REF: 2010018
Carshalton College
C&G-383 in Repair & Servicing of Road Vehicles (Levels 1 & 2)
Tel: 081 770 6800

REF: 2010124
Carshalton College
C&G-381 (Part 2) in Motor Vehicle Craft Studies
Tel: 081 770 6800

REF: 2010126
Carshalton College
C&G-381 (Part 3) in Motor Vehicle Craft Studies: Modular Syllabus
Tel: 081 770 6800

REF: 2010177
Carshalton College
National Certificate in Motor Vehicle Engineering
Tel: 081 770 6800

REF: 2060006
Norton-Radstock Coll of FE
C&G-383(2) (Pt 2) Motor Vehicle Craft Studies: Light Vehicles
Tel: 0761 33161

REF: 2060007
Norton-Radstock Coll of FE
C&G-383(1) in Motor Vehicle Craft Studies (R717B Skills Testing)
Tel: 0761 33161

REF: 2060019
Norton-Radstock Coll of FE
C&G-381(1) (Part II) in Motor Vehicle Craft Studies
Tel: 0761 33161

REF: 2080057
Soundwell Technical College
C&G-381 (Part 2) in Motor Vehicle Craft Studies, Vehicle Electricians
Tel: 0272 675101

REF: 2080064
Soundwell Technical College
National Certificate in Engineering (Motor Vehicle Engineering)
Tel: 0272 675101

REF: 2080251
Soundwell Technical College
C&G-383 in Repair and Servicing of Road Vehicles (Level 1)
Tel: 0272 675101

REF: 2080252
Soundwell Technical College
C&G-383 in Repair and Servicing of Road Vehicles (Level 2)
Tel: 0272 675101

REF: 2090014
South Bristol Coll
C&G-383 in Motor Vehicle Craft Studies (Levels 1, 2 and 3)
Tel: 0272 781958

REF: 2230038
Plymouth Coll of FE
C&G-381(1)(2)(3)(Pts 1, 2 & 3)-Motor Vehicle Craft Studies
Tel: 0752 385300

REF: 2230187
Plymouth Coll of FE
National Certificate in Engineering (Motor Vehicle Engineering)
Tel: 0752 385300

REF: 2230198
Plymouth Coll of FE
Motor Vehicle Servicing (YT)
Tel: 0752 385300

REF: 2230237
Plymouth Coll of FE
C&G-381 (Pt 2)-Motor Vehicle Craft Studs: Vehicle Electricians
Tel: 0752 385300

REF: 2230238
Plymouth Coll of FE
C&G-381 (Part 2) in Motor Vehicle Craft Studies: Light Vehicles
Tel: 0752 385300

REF: 2230239
Plymouth Coll of FE
C&G-381 (Part 2) in Motor Vehicle Craft Studies: Heavy Vehicles
Tel: 0752 385300

REF: 2230240
Plymouth Coll of FE
C&G-381 (Pt 3)-Motor Vehicle Craft Studs: Modular Syllabus
Tel: 0752 385300

REF: 2250023
South Devon C of Arts & Tech
C&G-390(2) in Motor Vehicle Technicians Studies
Tel: 0803 217567

REF: 2250162
South Devon C of Arts & Tech
C&G-381 (Part 2) in Motor Vehicle Craft Studies: Light Vehicles
Tel: 0803 217567

REF: 2250163
South Devon C of Arts & Tech
C&G-381 (Part 2) in Motor Vehicle Craft Studies: Heavy Vehicles
Tel: 0803 217567

REF: 2250164
South Devon C of Arts & Tech
C&G-381 (Part 3) in Motor Vehicle Craft Studies: Modular Syllabus
Tel: 0803 217567

REF: 2250165
South Devon C of Arts & Tech

South Bristol Coll
C&G-381(1)(2) (Parts 1, 2 and 3) in Motor Vehicle Craft Studies
Tel: 0272 781958

REF: 2090048
South Bristol Coll
National Certificate in Motor Vehicle Engineering
Tel: 0272 781958

REF: 2100071
Weston-super-Mare Coll of FE
C&G-381(1)(2) (Parts 1 and 2) in Motor Vehicle Craft Studies
Tel: 0934 621301

REF: 2100208
Weston-super-Mare Coll of FE
C&G-383 (Pt 2) Motor Vehicle Craft Studies: Light Vehicles
Tel: 0934 621301

REF: 2130004
Cornwall College
National Certificate in Motor Vehicle Engineering
Tel: 0209 712911

REF: 2130011
Cornwall College
C&G-390(1)(2)(3) in Motor Vehicle Technician's Studies
Tel: 0209 712911

REF: 2130062
Cornwall College
C&G-381 (Parts I, II and III) in Motor Vehicle Craft Studies
Tel: 0209 712911

REF: 2130266
Cornwall College
C&G-381 (Part 2) in Motor Vehicle Craft Studies: Light Vehicles
Tel: 0209 712911

REF: 2130267
Cornwall College
C&G-381 (Part 2) in Motor Vehicle Craft Studies: Heavy Vehicles
Tel: 0209 712911

REF: 2160027
St Austell College
C&G-381 (1)(2)Cert Pts 1 & 2 in Motor Vehicle Craft Studies
Tel: 0726 67911

REF: 2160041
St Austell College
C&G Servicing and Repair of Road Vehicles
Tel: 0726 67911

REF: 2180033
East Devon College
C&G-383 (Parts I, II and III) in Repair and Servicing of Road Vehicles
Tel: 0884 254247

REF: 2180107
East Devon College
C&G-381 (Part III) in Motor Vehicle Craft Studies: Modular Syllabus

Canterbury College
C&G-381 (Part 3) in Motor Vehicle Craft Studies. Modular Syllabus
Tel: 0227 66081

REF: 4990050
Carlisle Technical College
National Certificate in Motor Vehicle Engineering
Tel: 0228 24464

REF: 4990052
Carlisle Technical College
Motor Industry Examinations
Tel: 0228 24464

REF: 4990058
Carlisle Technical College
C&G-381(1)(2) (Parts 1 and 2) in Motor Vehicle Craft Studies
Tel: 0228 24464

REF: 4990177
Carlisle Technical College
C&G-381 (Part 2) in Motor Vehicle Craft Studies: Light Vehicles
Tel: 0228 24464

REF: 4990178
Carlisle Technical College
C&G-381 (Part 2) in Motor Vehicle Craft Studies: Heavy Vehicles
Tel: 0228 24464

REF: 4990179
Carlisle Technical College
C&G-381 (Part 3) in Motor Vehicle Craft Studies: Modular Syllabus
Tel: 0228 24464

REF: 5000126
Stoke-on-Trent College
College Cert in Plant Vehicle Electrics & Diagnostic Procedures
Tel: 0782 208208

REF: 5000293
Stoke-on-Trent College
C&G-398 Pt 1 Vehicle Body Competences: Light Vehicle Body Repair
Tel: 0782 208208

REF: 5000386
Stoke-on-Trent College
National Certificate in Engineering (Motor Vehicle Engineering)
Tel: 0782 208208

REF: 5000388
Stoke-on-Trent College
Certificate in Motor Vehicle Retail and Repair
Tel: 0782 208208

REF: 5000389
Stoke-on-Trent College
Motor Vehicle Mechanics
Tel: 0782 208208

REF: 5000390
Stoke-on-Trent College
C&G-381 (Part 2) in Motor Vehicle Craft Studies: Vehicle Electricians
Tel: 0782 208208

Chippenham Technical College
C&G-381 (Part 3) in Motor Vehicle Craft Studies: College Syllabus
Tel: 0249 444501

REF: 2490192
Salisbury College of Tech
C&G-383 Motor Veh Craft Stud: Light Vehs (Lvls 1, 2 & 3)
Tel: 0722 23711

REF: 2490193
Salisbury College of Tech
C&G-381 (Part 3) in Motor Vehicle Craft Studies: Modular Syllabus
Tel: 0722 23711

REF: 2500075
Swindon College
C&G-390 (Pts 1, 2 & 3) in Motor Vehicle Technician's Studs
Tel: 0793 491591

REF: 2500084
Swindon College
NC in Motor Vehicle Engineering Mechanics/Body
Tel: 0793 491591

REF: 2500089
Swindon College
C&G-381 (Parts 1, 2 and 3) in Motor Vehicle Craft Studies
Tel: 0793 491591

REF: 2500265
Swindon College
National Certificate in Engineering (Motor Vehicle Repair)
Tel: 0793 491591

REF: 2500364
Swindon College
First Certificate in Motor Vehicle Studies
Tel: 0793 491591

REF: 2500368
Swindon College
C&G-383-Repair & Servicing of Road Vehicles (Lvls 1-3)
Tel: 0793 491591

REF: 2510064
Trowbridge College
C&G-381 (Pts 1 & 2) - MV Craft Studies (Light Vehicle Mechanics)
Tel: 0225 766241

REF: 2510265
Trowbridge College
National Certificate in Engineering (Motor Vehicle Engineering)
Tel: 0225 766241

REF: 2590028
Salford College of FE
C&G-381(1)(2) (Parts I and II) in Motor Vehicle Craft Studies
Tel: 061 702 8272

REF: 2690054
Hugh Baird College of Tech
C&G-381(1)(2) (Parts I and II) in Motor Vehicle Craft Studies
Tel: 051 922 6704

Tel: 0604 735500

REF: 3940066
Nene College
National Certificate in Motor Vehicle Engineering
Tel: 0604 735500

REF: 3990026
Beverley College of FE
C&G-381 Certificate (Parts 1, 2 and 3) in Motor Vehicle Craft Studies
Tel: 0482 868362

REF: 4000041
East Yorkshire College of FE
Motor Vehicle Craft
Tel: 0262 672676

REF: 4000088
East Yorkshire College of FE
C&G-381 (Part I) in Motor Vehicle Craft Studies
Tel: 0262 672676

REF: 4000089
East Yorkshire College of FE
C&G-381 (Part II) in Motor Vehicle Craft Studies: Vehicle Electricians
Tel: 0262 672676

REF: 4020013
Hull College of FE
C&G-381(6) in Motor Vehicle Craft Studies
Tel: 0482 29943

REF: 4020017
Hull College of FE
C&G-383 in Repair and Servicing of Road Vehicles (Level 1, 2 and 3)
Tel: 0482 29943

REF: 4020247
Hull College of FE
National Certificate in Motor Vehicle Studies (Engine or Body)
Tel: 0482 29943

REF: 4020341
Hull College of FE
First Certificate in Motor Vehicle Studies
Tel: 0482 29943

REF: 4030050
City of Westminster College
C&G-383(1) (Part 1) in Repair and Servicing of Road Vehicles
Tel: 071 723 8826

REF: 4030053
City of Westminster College
Road Transport Integrated Training Modules
Tel: 071 723 8826

REF: 4030054
City of Westminster College
C&G-381/383 - Repair & Servicing of Road Vehicles/Craft Studies
Tel: 071 723 8826

REF: 4030128

Harlow College
C&G-381 (Pt 2) - Motor Vehicle Craft Studies: Vehicle Electricians
Tel: 0279 441288

REF: 5350160
Harlow College
C&G-381 (Part II) in Motor Vehicle Craft Studies: Light Vehicles
Tel: 0279 441288

REF: 5350161
Harlow College
C&G-381 (Part II) in Motor Vehicle Craft Studies: Heavy Vehicles
Tel: 0279 441288

REF: 5370053
Havering F & HE College
C&G-383(1)(Pt 1)/381(2)(3)(6)(Pts 2/3)-Rep/Serv Rd Veh/Mot Veh Cr Stud
Tel: 0708 455011

REF: 5370054
Havering F & HE College
National Certificate in Engineering (Motor Vehicle Engineering)
Tel: 0708 455011

REF: 5380021
North Shropshire College
C&G-381 in Light & Heavy Vehicle Service & Repair
Tel: 0691 653067

REF: 5380098
North Shropshire College
C&G-381 (Part II) in Motor Vehicle Craft Studies: Light Vehicles
Tel: 0691 653067

REF: 5380099
North Shropshire College
C&G-381 (Part II) in Motor Vehicle Craft Studies: Heavy Vehicles
Tel: 0691 653067

REF: 5410022
Highbury College
First Certificate in Motor Vehicle Engineering
Tel: 0705 383131

REF: 5410066
Highbury College
National Certificate in Motor Vehicle Engineering
Tel: 0705 383131

REF: 5410075
Highbury College
C&G-383-Repair & Servicing of Road Vehicles (Lvls 1, 2 & 3)
Tel: 0705 383131

REF: 5410231
Highbury College
C&G-381 (Part 3) in Motor Vehicle Craft Studies: Modular Syllabus
Tel: 0705 383131

REF: 5430061
Isle of Wight College
C&G-390(1)(2) (Parts 1 & 2) in Motor Vehicle Technician's Studies
Tel: 0983 526631

Introduction to Vehicle Maintenance
Tel: 081 472 1480

REF: 5200088
Newham Community College
C&G-381(1)(2)(6) (Parts I, II and III) in Motor Vehicle Craft Studies
Tel: 081 472 1480

REF: 5210022
East Surrey College
National Certificate in Motor Vehicle Engineering
Tel: 0737 772611

REF: 5210168
East Surrey College
C&G-383 (Part 1) in Motor Vehicle Craft Studies
Tel: 0737 772611

REF: 5210169
East Surrey College
C&G-383 (Part 2) in Motor Vehicle Craft Studies: Light Vehicles
Tel: 0737 772611

REF: 5210170
East Surrey College
C&G-381 (Part 2) in Motor Vehicle Craft Studies (Heavy Vehicles)
Tel: 0737 772611

REF: 5210171
East Surrey College
C&G-383 (Part 3) in Motor Vehicle Craft Studies: Vehicle Electrics
Tel: 0737 772611

REF: 5240121
Farnborough Coll of Technology
C&G-390(1)(2)(3) (Parts 2 and 3) in Motor Vehicle Technicians
Tel: 0252 391212

REF: 5240124
Farnborough Coll of Technology
C&G-383 in Repair & Servicing of Road Vehicles (Lvls 1, 2 & 3)
Tel: 0252 391212

REF: 5240287
Farnborough Coll of Technology
C&G-381 (Part 3) in Motor Vehicle Craft Studies: Modular Syllabus
Tel: 0252 391212

REF: 5240395
Farnborough Coll of Technology
National Certificate in Engineering (Motor Vehicle Studies)
Tel: 0252 391212

REF: 5250055
Gateshead Technical College
C&G-381(1) (Part 1) in Motor Vehicle Craft Studies
Tel: 091 477 0524

REF: 5250056
Gateshead Technical College
C&G-381(2) (Part 2) in Motor Vehicle Craft Studies
Tel: 091 477 0524

Appendix 2

Sample of college courses and entry requirements:

- Motor vehicle and mechanical engineering part-time courses;
- Motor vehicle and mechanical engineering full-time courses;
- Motor vehicle women only courses (Bradford & Ilkley Community College).

MOTOR VEHICLES CRAFT STUDIES COURSE PART I CGLI 383

Part time day

One year

Content:
Vehicle Technology; Associated Studies; General Studies.

Entry requirements:
A satisfactory basic educational record and successful college interview. The student should be following an appropriate apprenticeship.

Qualification Obtained:
City & Guilds Motor Vehicle Craft Studies, Part one certificate.

Progression:
Satisfactory completion will allow entry into the C & G Part II course.

MOTOR VEHICLES CRAFT STUDIES COURSE PART II II CGLI 381/383

Part time day

Two years

Content:
Motor Vehicle Technology; Mathematics; Science; Drawing Garage Practice and General Studies.

Entry requirements:
C & G Motor Vehicle Craft Studies part one tor its equivalent.

Qualification Obtained:
At the end of the first year students will take a UEI examination. City & Guilds Craft Studies Part II will be taken at the end of year two.

Progression:
C & G Part III modules or BTEC National Certificate.

MOTOR VEHICLES CRAFT STUDIES COURSE PART III CGLI 381

Part time evening

Content:
This comprises 3 modules.
Electronics & Microprocessor applications; Vehicle battery and charging systems; Fuel injection equipment for compression ignition engines.

Entry requirements:
C & G Part II. There are special arrangements for mature students.

CITY AND GUILDS MECHANICAL ENGINEERING COMPETENCES

BASIC ENGINEERING COMPETENCES LEVEL I CGLI 201

Part time day and evening

1 Year

Content:

201- Basic engineering technology, practical course work assessment, science background to technology

Basic CNC - Principles of numerical control, computer fundamentals, part programs, machine operation.

Entry requirements
Satisfactory basic educational record and successful college interview. The student should be following an appropriate apprenticeship.

Qualification Obtained:
C & G Basic Engineering Competences

Progression:
C & G Mechanical Production Competences Part II.

MECHANICAL PRODUCTION COMPETENCES LEVEL II CGLI 228

Part time day/evening

2 Years

Content:
Industrial studies, engineering materials, measurement and dimensional control, machine tool systems and operation, practical/course work assessment.

CNC endorsement:
Hazards of CNC, constructional details, work holding and setting,tool preparation and maintenance, drawings and documentation, data preparation and input.

CNC Programming endorsement:
Computer fundamentals, program pre-planning, part programming, advanced technology - FMS etc, project work.

Entry requirements
Part I CGLI 200, 201 or equivalent.

Qualification Obtained:
C & G Mechanical Production Competences Part II.

Progression:
C & G Craft Studies Level III.

Content:
Machining for production, special machining processes, control systems, in-process measurement, material removal, specifications and testing, planning and costing, practical course work assessment.

CNC Advanced Part Programming endorsement:
Pre-planning, manual and computer aided programming, computer integrated manufacture, project work.

Entry requirements:
Level II CGLI NO 205, 228 or equivalent

Qualification Obtained:
C & G Engineering Craft Studies Part III

Progression:
C & G Computer Aided Engineering Modules.

Motor Vehicle and Mechanical Engineering Craft Studies

Introduction

This full programme course is designed to meet the needs of trainees seeking skills in the two disciplines of motor vehicle studies and mechanical engineering.

Entry Requirements

Selection is by interview and you should have satisfactory results at GCSE level. An aptitude test is available for any student who has not attained the necessary exam results.

What will I study?

You will undertake equal study in mechanical and motor vehicle engineering, leading to NVQ qualifications awarded by a lead body, approved by the Motor Industry Training Standards Council "MITSC". City & Guilds NVQ qualification in engineering competencies.

Subjects Studied

- Motor Vehicle NVQ

- Basic Engineering Competencies NVQ

Assessment and Grading

Assessment is by one or more of the following methods:

- Continuous monitoring of progress by means of assignments, practical tasks, and internal and/or external examinations. All necessary guidance and assistance will be given to all students requiring this important aspect of training.

Career Prospects

Students successfully completing the course may choose to specialise in a particular area when further study will be offered on a day release or full programme basis, as appropriate for the individual student requirements.

It can be used as a lead into higher level courses or for enhancing future employment prospects.

Duration

Two year programme studying towards NVQ II including City & Guilds qualification in the 1st year. There is the option of a third year NVQ Level III which leads on to an IMI Supervisory qualification.

BTEC GNVQ Intermediate in Engineering with Motor Vehicle Studies

Introduction

It is a new work-related qualification designed to offer you a choice of routes both in education and into employment. It is part of the national framework of vocation qualifications which has five levels. Intermediate GNVQ's are the same level as GCSE's.

The BTEC GNVQ Intermediate in Engineering is equivalent to BTEC First Diploma in Engineering.

It will give you a broad based introduction to your chosen career.

Entry Requirements

Selection is by interview and you should be competent in English, Mathematics and Science and have, GCSEs Grade D or above in Mathematics, English and Science. Mature students may be admitted through the NVQ APL system.

What will I study?

You will study four mandatory units and two optional units and you will develop core skills. You may also be able to take additional units.

The four mandatory skill units are:

- Engineering materials and processes
- Graphical communication in engineering
- Science and mathematics for engineering
- Engineering in society and the environment

Three core skill units are:

- Communication
- Application of Number
- Information Technology

Two optional units:

- Electronic principles and applications
- Vehicle technology

Assessment and Grading

The programme is assessed by a range of methods which may include projects, assignments, case studies and coursework. There will also be external written tests for each Mandatory Unit. You will have a Portfolio of evidence to keep you work in.

You may be given credits for some units if you have covered parts of the programme before.

You can record your success on a BTEC GNVQ in your National Record of Achievement.

If your work is outstanding you may be awarded a Merit or Distinction for your GNVQ, but individual units are not graded.

Career Prospects

This qualification helps you to go on to higher level qualifications, such as BTEC GNVQ Advanced or A levels, or you can go straight into work. It prepares you for a whole range of career opportunities in; Motor vehicle engineering and Business/Management.

Duration

BTEC GNVQ Intermediate are normally one year programmes, or longer if required.

BTEC National Diploma in Motor Vehicle Studies

Entry Requirements

You will be required to show evidence of your suitability for the proposed course either by a satisfactory performance in the GNVQ Intermediate in Engineering with Motor Vehicle Studies or by obtaining adequate grades in relevant GCSE subjects.

For direct entry, it is expected that you will have gained a GCSE grade C or above in at least 4 subjects including Mathematics, Science (as a double subject) and English Language.

In practice, most students on the course posses a grade B in either Mathematics or Science.

What will I study?

The BTEC National Diploma course consists of studying 16 units each of 60 hours duration. In addition you will be involved in a period of work experience in a local garage. The programme contains the following topics which are designed to encompass the whole range of mechanical, electrical and electronic engineering associated with the modern motor vehicle.

- Vehicle Technology
- Electrical/Electronic Principles
- Engineering Application of Computers
- Industry and Society
- Mathematics
- Science
- Engineering Materials
- Engineering Drawing

These topics are divided into year groups; for example in year 1 students will cover those units associated with BTEC level II. The more advanced units known as BTEC level III will be studied in year 2 of the course.

A project involving both practical and theoretical investigation and design work will be taken by all students during the final year.

Assessment and Grading

Throughout the programme assessment will take place by BTEC moderated continuous assessment. This can take the form of a combination of practical or written assignments, periodic phase tests and final end test in each unit.

In addition there are several integrated assignments each of which is designed to incorporate varied skills and knowledge. They will be drawn from several different units so that each subject area is not treated in isolation but drawn together in the general aim of promoting problem solving abilities within a technological environment.

Career Prospects

The programme is designed to provide students with a sound understanding of the modern vehicle. Successful completion of the course at appropriate levels of attainment will enable students to progress to Degree, Higher Diploma or Higher Certificate courses or alternatively place them in a competitive position to gain employment within the motor vehicle industry.

Duration

Two year programme.

BTEC National Diploma in Engineering

Entry Requirements

You will be required to show evidence of your suitability for the proposed course either by a satisfactory performance in the GNVQ Intermediate in Engineering or by obtaining adequate grades in relevant GCSE subjects. For direct entry, it is expected that you will have gained a GCSE grade C or above in at least 4 subjects including Mathematics, Science (as a double subject) and English Language.

In practice, most students on the course posses a grade B in either Mathematics or Science.

What will I study?

The BTEC National Diploma course consists of studying 18 whole units each of 60 hours duration. In addition there is involvement with other units of workshop practice and a period of work experience.

The programme contains the following topics which are designed to encompass the whole range of mechanical electrical and electronic engineering.

Level NII

- Mathematics
- Science
- Electrical & Electronic Principles
- Electronics
- Micro-electronic Systems
- Engineering Application of Computers
- Manufacturing Technology
- Engineering Drawing
- Engineering Materials
- Industry & Society

Level NIII

- Mathematics
- Science
- Electrical & Electronic Principles
- Electronics
- Micro-electronic Systems
- Software Design Method
- Engineering Design
- Computer Aided Draughting
- Introduction to Numerical Control
- Control of Manufacture Project

The majority of the NII units are studied during the first year of the course leaving the more advanced NIII units for the final year. Whilst certain core units are taken by all students, there are several optional units (mainly at NII level) to enable you to choose a combination most suited to your developing interests and requirements of your future career or higher education course. A project involving both practical and theoretical investigation and design work will be taken by all students during the final year.

Assessment and Grading

Throughout the programme assessment will take place by BTEC moderated continuous assessment.

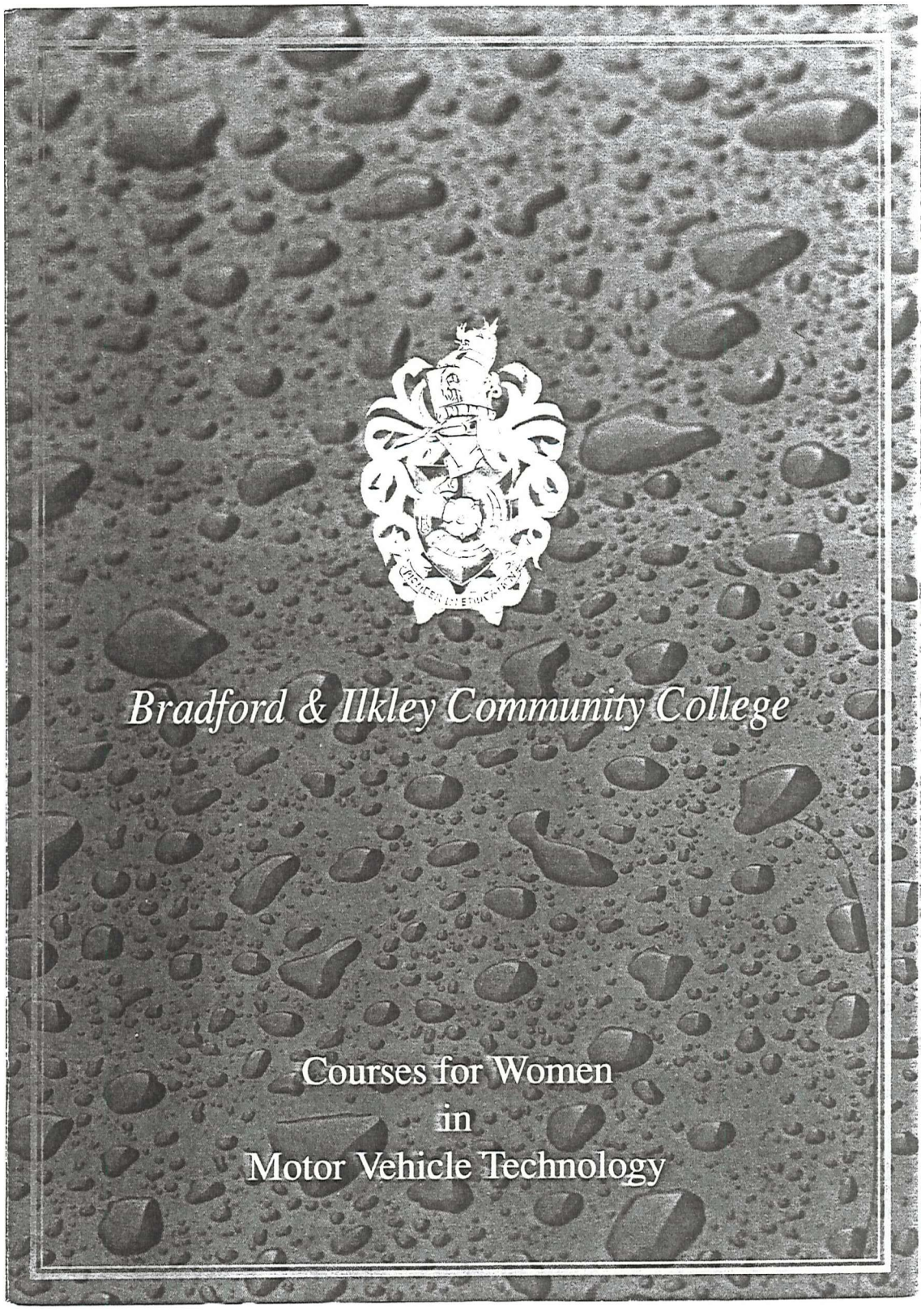
Career Prospects

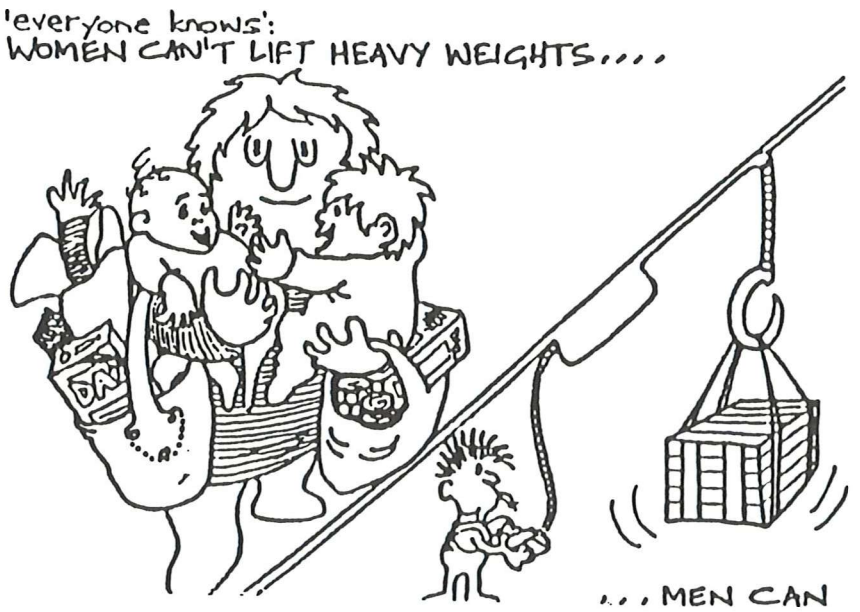
The programme is designed to provide you with a sound understanding of the fundamental principles of a wide range of disciplines covering all aspects of Mechanical, Electrical and Electronic Engineering as well as introducing current industrial applications and the modern involvement of computers and micro-electronics.

Successful completion of the course at appropriate levels of attainment will enable you to progress to Degree, Higher Diploma or Higher Certificate courses or alternatively place you in a competitive position to gain employment within the engineering industry.

Duration

Two year programme.


Bradford & Ilkley Community College
Courses for Women
in
Motor Vehicle Technology



More and more women are training in Motor Vehicle Technology . . .

Could this be the course for you?

Look inside for new courses starting September

YOUNG WOMEN'S MOTOR VEHICLE TECHNOLOGY YTS

This programme has twelve places for young women looking for training and work experience in the motor trade. The two-year programme consists of an induction period followed by three days per week in work placement and two days per week in College following a City and Guilds course, upgrading maths, English and computer skills and following a job search programme.

The course aims to:

1. prepare young women for work in a garage situation
2. achieve City & Guilds Motor Vehicle Technology
3. achieve City & Guilds Communication Skills

ENTRY QUALIFICATIONS

1. enthusiasm
2. interest in motor vehicles
3. willingness to work in "a man's world"

This course has a woman course tutor and a woman auto workshop tutor.

The YTS training allowance is payable and help is available with bus fares over £3 per week.

Overalls and work boots are provided.

A residential experience is a planned part of the programme.

Women's Courses in Motor Vehicle Technology

- Two courses starting **September 23rd 1991** for women, taught mainly by women tutors.
- Each course will last one year till July 1992.

Motor Vehicle Electricians

If you've got the spark?
Then solder on down to the women's auto-electrician course. Lots of practical experience from basic wiring to use of test meters to electronic systems. Absolute beginners.

Motor Vehicle Repair and Servicing

Are you ready for changing gear?
Then put on boots and overalls and join in with other beginners getting to grips with the nuts and bolts of repair and maintenance of light vehicles.

BOTH COURSES ARE TO CITY AND GUILDS STANDARD WITH THE OPPORTUNITY TO UNDERTAKE WORK PLACEMENTS.

Still interested? Then read on!

Do I have to have any experience?
No! Just enthusiasm and commitment.

What age do I have to be?
Any age over 18.

How long are the courses?
Both courses are for one year minus college holidays.

How many days a week are the courses?
Four days a week.

How long is each day?
From 9.30 am — 3.00 pm with breaks.

What about my children?
There are childminding expenses for under 5s.

Does it affect my benefit?
No! The course is 21 hours a week.

Is there any charge?
No. The course is FREE and you get your travel expenses.

Fuelled up and ready to go . . .

For more information and enrolment come down and meet us:

Appendix 3

Sample of European courses aimed at women craft engineering and motor vehicle courses (extracted from the IRIS directory).

España

E 066-01

Tecnicas en Venta

Training in car sales for women of all ages

Address: Consejeria Bienestar Social Avda Portugal 77, E - 45071 Toledo
Tel./Fax./E-mail: tel: (34.25)267200
Contact: Barranco Barranco, Concha
Name of organisation: Consejeria de Educacion y Cultura de Castilla-La Mancha
IRIS entry date: 1991
Languages spoken: es \ fr
Training sector: service in the retail sector

E 019-01

Programa de formacio occupacio Dones Roquetes

Orientation and basic vocational training course in various sectors including on-the-job experience

Address: C/Vidal i Guasch 76-78, E - 08033 Barcelona
Tel./Fax./E-mail: tel: (34.3)3592898, fax:(34.3)3592898
Contact: Hidalgo, Carmen/Castells, Teresa
Name of organisation: Pla Integral de Roquetas (Ayuntamiento de Barcelona)
IRIS entry date: 1989
Languages spoken: es \ fr \ en
Training sector: handicraft techniques / computer office skills / administration / semi-skilled manual work / enterprise creation

United Kingdom

UK 055-01

Women's Access to Gaining Employment (W.A.G.E.)
Pretraining and basic vocational skills with work orientation towards jobs where women are under-represented

Address: Midmill Offices, Pitkerro Road, GB - DD4 8HD Dundee
Tel./Fax./E-mail: tel: (44.382)500345, fax: (44.382)501072
Contact: Hugman, Andy
Name of organisation: Work-Start
IRIS entry date: 1991
Languages spoken: en \ fr \ gr
Training sector: semi-skilled manual work / computer office skills / enterprise creation

Deutschland

D 020-01

"Mädchen können alles"
Training workshop in technical skills for school leavers in Mannheim

Address: F 7, 22-23, D - 6800 Mannheim
Tel./Fax./E-mail: tel: (49.621)106794
Contact: Maas, Beate
Name of organisation: Projekt Mannheim
IRIS entry date: 1991
Languages spoken: de \ en
Training sector: semi-skilled manual work / handicraft techniques

Danmark

DK 023-01

"Hvad vil du med dit liv?"

Pretraining, guidance and personal assessment with basic vocational training in various sectors for women of all ages

Address: Hvolgården 62, DK - 9310 Vodskov
Tel./Fax./E-mail: tel: (45.98)256176, fax: (45.98)259134
Contact: Andersen, Grethe
Name of organisation: Vester Hassing skole/Hals Kommune
IRIS entry date: 1991
Languages spoken: da \ en
Training sector: computer office skills / media-communication-information techniques / handicraft techniques / design-artistic skills

Appendix 4

Sample of one college's information outlining their courses and the numbers of students (both male and female) enrolled on them.

MODULE : SE
MENU OPTION : 4/C/E Stats- Course/Sex DATE: 29/01/92
REPORT NO : 280 PAGE: 11

		FEMALE STUDENTS 1991/2	FEMALE STUDENTS 1990/1
Course :460349 C&G 201 BASIC ENG COMPETENCE STUDIES			
Male	10	—	—
Total for course 460349	10		
Course :460350 ~~C&G MECH.ENG.CRAFT.ST.CS2 YR1~~			
Male	16	—	1
Total for course 460350	16		
Course :460351 ~~C&G MECH.ENG.CRAFT.ST.CS3 YR2~~			
Male	12	—	—
Total for course 460351	12		
Course :460352 ADV MACH ENG CRAFT ST.PT 3 C4			
Male	5	—	—
Total for course 460352	5		

		1991/2	1990/1
Total for course 460362	14		
Course :460363 BTEC HIGHER CERT MECH/MAN ENG YR 2			
Male 11		—	—
Total for course 460363	11		
Course :460371 BASIC CRAFT ENG COMP ST.(FAB) YR 1			
Male 4		—	—
Total for course 460371	4		
Course :460372 FAB & WELD CRAFT ST YR.2			
Male 6		—	—
Total for course 460372	6		
Course :460373 FAB & WELD CRAFT ST YR.3			
Male 6		—	—
Total for course 460374	6		
Course :460381 C&G MOTOR VEH CRAFT ST PT.1			
Female 1			
Male 28		1	3
Total for course 460381			

			FEMALE STUDENTS 1991/2	1990/1
Course :460382 ~~C&G MOTOR VEH CRAFT ST YR 2~~				
Female	1		1	—
Male	16			
Total for course 460382		17		
Course :460383 C&G MOTOR VEH CRAFT ST YR 3				
Male	12		—	—
Total for course 460383		12		
Course :460384 C&G MOTOR VEH CRAFT ST(ADV) C4				
Male	7		—	—
Total for course 460384		7		
Course :460387 BTEC CERT MOTOR VEH ENG YR 2				
Male	10		—	—
Total for course 460387		10		
Course :460388 HNC MOTOR VEH ENG YR.1				
Male	4		—	—
Total for course 460388		4		

Appendix 5

City & Guilds of London Institute listing of students entering and passing motor vehicle and engineering courses in 1991 (no gender breakdown).

TABLE A FOR INDUSTRIAL GROUPING - 05 ENGINEERING

ALL SERIES 1990/91

COURSE TYPE & LEVEL - C1

		ENGLAND	WALES	SCOTLAND	N IRELAND	EIRE	OTHER HOME	TOT HOME	OSEAS	TOTAL
2011(01)	AWARD	2841	289	5	36	20	6	3197	0	3197
	FAIL	93	11	0	2	0	0	106	0	106
	REFRD	568	88	1	7	2	3	669	0	669
	ABSENT	332	33	2	5	0	3	375	0	375
	NO AWARD TOTAL	993	132	3	14	2	6	1150	0	1150
	TOTAL	3834	421	8	50	22	12	4347	0	4347
2011(02)	AWARD	113	0	0	3	0	0	116	0	116
	FAIL	3	0	0	0	0	0	3	0	3
	REFRD	12	0	0	0	0	0	12	0	12
	ABSENT	12	0	0	0	0	0	12	0	12
	NO AWARD TOTAL	27	0	0	0	0	0	27	0	27
	TOTAL	140	0	0	3	0	0	143	0	143
2011(03)	AWARD	1127	159	5	53	9	0	1353	0	1353
	FAIL	31	6	0	5	0	0	42	0	42
	REFRD	268	36	1	16	0	0	321	0	321
	ABSENT	188	19	2	12	0	0	221	0	221
	NO AWARD TOTAL	487	61	3	33	0	0	584	0	584
	TOTAL	1614	220	8	86	9	0	1937	0	1937
2011(04)	AWARD	16	1	0	88	0	0	105	0	105
	FAIL	0	0	0	0	0	0	0	0	0
	REFRD	6	0	0	16	0	0	22	0	22
	ABSENT	0	0	0	9	0	0	9	0	9
	NO AWARD TOTAL	6	0	0	25	0	0	31	0	31
	TOTAL	22	1	0	113	0	0	136	0	136
2011(05)	AWARD	266	42	0	0	45	0	353	0	353
	FAIL	7	0	0	0	0	0	7	0	7
	REFRD	45	4	0	0	0	0	49	0	49
	ABSENT	31	4	0	0	0	0	35	0	35
	NO AWARD TOTAL	83	8	0	0	0	0	91	0	91
	TOTAL	349	50	0	0	45	0	444	0	444

TABLE A FOR INDUSTRIAL GROUPING - 06 VEHICLES ALL SERIES 1990/91

COURSE TYPE & LEVEL - C3

		ENGLAND	WALES	SCOTLAND	N IRELAND	EIRE	OTHER HOME	TOT HOME	OSEAS	TOTAL
3837(69)	AWARD	252	17	0	0	0	0	269	0	269
	FAIL	94	3	0	0	0	0	97	0	97
	REFRD	0	0	0	0	0	0	0	0	0
	ABSENT	17	0	0	0	0	0	17	0	17
	NO AWARD TOTAL	111	3	0	0	0	0	114	0	114
	TOTAL	363	20	0	0	0	0	383	0	383
3837(70)	AWARD	76	0	0	0	0	0	76	0	76
	FAIL	16	1	0	0	0	0	17	0	17
	REFRD	0	0	0	0	0	0	0	0	0
	ABSENT	3	0	0	0	0	0	3	0	3
	NO AWARD TOTAL	19	1	0	0	0	0	20	0	20
	TOTAL	95	1	0	0	0	0	96	0	96
3837(71)	AWARD	308	17	0	0	0	0	325	0	325
	FAIL	117	1	0	0	0	0	118	0	118
	REFRD	0	0	0	0	0	0	0	0	0
	ABSENT	14	0	0	0	0	0	14	0	14
	NO AWARD TOTAL	131	1	0	0	0	0	132	0	132
	TOTAL	439	18	0	0	0	0	457	0	457
3837(72)	AWARD	68	1	0	0	0	0	69	0	69
	FAIL	30	0	0	0	0	0	30	0	30
	REFRD	0	0	0	0	0	0	0	0	0
	ABSENT	3	0	0	0	0	0	3	0	3
	NO AWARD TOTAL	33	0	0	0	0	0	33	0	33
	TOTAL	101	1	0	0	0	0	102	0	102
3837(73)	AWARD	200	16	0	0	0	0	216	0	216
	FAIL	88	3	0	0	0	0	91	0	91
	REFRD	0	0	0	0	0	0	0	0	0
	ABSENT	10	0	0	0	0	0	10	0	10
	NO AWARD TOTAL	98	3	0	0	0	0	101	0	101
	TOTAL	298	19	0	0	0	0	317	0	317

Appendix 6

Example of the questionnaire and covering letter sent out to each student.

To: All Engineering Students

Dear Trainee

I am undertaking a research project concerning craft level engineering courses. The attached questionnaire has been designed to provide information which will be used with a view to improving such courses for all future trainees, not only in this country but throughout the EEC.

The information provided will be used **solely for the purposes of my research**, and **no employers or college authorities will have access to it**. Candid responses to the questions posed may therefore be made without fear!

If you feel you would like to add additional comments, please do so on a separate sheet of paper. The completed quesionnaire should be firmly sealed in the envelope provided and returned to the Dean's Secretary by **Friday 5th June**. In this way, total confidentiality will be ensured.

Thank you very much for your assistance.

Yours sincerely

QUESTIONNAIRE (mixed groups)

CONFIDENTIAL

NAME	MALE ☐	FEMALE ☐	AGE

SCHOOL LAST ATTENDED

QUALIFICATIONS GAINED AND LEVELS

FUTURE AIMS

When did you decide to become an engineer?

What influenced your decision to become an engineer?

If you decided whilst at school did you ask any of your teachers for advice concerning your career choice? If so what was their advice/comment to you?

Did you seek advice from anyone else? If so, who, and please state what advice they gave?

Do you feel that the advice given by any of the above was helpful or unhelpful?

What was the reaction/attitude of your parents when you first told them you wished to become an engineer and has it since changed? If so, in what way?

What was the reaction/attitude of your friends when you told them you wished to become an engineer and has it since changed? If so, in what way?

Are either of your parents employed in engineering? If so please indicate what type of engineer they are, e.g. electrical, mechanical, etc.

When you enrolled at college did you find the experience:-

Very easy? ❑ Fairly easy? ❑ Difficult? ❑ Very difficult? ❑

Please give a brief reason why you found it one of the above.

Do you think the lecturers are helpful and sympathetic to your needs? Please describe your feelings about the lecturing staff.

Which of the following best describes the attitude of your fellow students?

Female Very friendly? ❑ Friendly? ❑ Unfriendly? ❑ Hostile? ❑

Male Very friendly? ❑ Friendly? ❑ Unfriendly? ❑ Hostile? ❑

What do you think about the attitudes of the lecturing staff that take your group?

(a) Towards others.

(b) Towards you.

What were your feelings during the first few weeks of the course?

Did you feel you had the necessary support from college staff in the first few weeks of the course? Please give reasons for your answer.

Do you feel that you could talk to any member of the teaching staff about any problems whether personal or academic?

Do you feel that the appointment of a female lecturer to teach engineering would be of benefit for female engineering students? Give reasons for your answer.

Do you think the personal facilities (toilets, lockers, etc.) are adequate both at college and within your work placement?

On which basis would you prefer to attend college?

Day release ❑ Block release ❑ Full time ❑

If given the option would you prefer to go into a segregated group? Please give reasons for your answer.

In the first few weeks of starting work were you given sufficient help and assistance regarding settling in? Please give reasons for your answer.

What do you think about the attitude of your employer?

(a) Towards the work force.

(b) Towards yourself.

What do you think about the attitude of your fellow workers towards yourself?

Do they treat you differently to anyone else? YES ❑ NO ❑

HANK YOU FOR YOUR CO-OPERATION.

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