

Mr G. G. Green Unit Ten

A Critical Discussion of are Successive Government Educational Policies in the F. E. Sector Deskillling The British Engineering Workforce? A Report By Mr G. G. Green 1992.

This investigative report is dedicated to all those engineers and craftsmen who devoted their lives and energies to the betterment of the Human Race, whos traditions and ways of life I was born into and am trying desperately to maintain and uphold against present day attitudes and thinking.

A wise man will hear, and will increase learning; and a man of understanding shall attain unto wise counsels.

Proverbs, Chapter One, Verse Five

"For investigating the unknown we greatly need manual industry, without which we can accomplish nothing perfectly. Yet there are many things subject to the rule of reason which we can not completely investigate by the hand".

Peter the Pilgrim, deMagnetete 1269.

Section One: Introduction: Aims of this Investigation and the Government Education Acts Since 1981

Section Two: What Constitutes a Skill

Section Three: Pre 1981 Teaching a Skill from Dewey and Pragmatism, Skinner and Behaviourism

Section Four: Government Policies Since 1981, and R. Johnathan's Manpower Services Model of Education 1985, R. Barrow AND M. Griffiths 1987

Section Five: Are there any Common Links Between Dewey/Skinner and Johnathan/Barrow/Griffith and The Educational Models they Propose for the Teaching of Skills

Section Six: Conclusion: What are The Implications of Adopting the M. S. C Model of Education for Students and Teachers

Section One: Introduction: Aims of this Investigation and the Government Education Acts Since 1981

As the reader may or may not be aware there has been since 1981 major educational reforms. Usually only those concerned with education within the state school system are given any exposure by the mass media. Along with these changes in education for schools, there has also been major educational reforms that have taken place within further and higher education.

It is the intention of this report to investigate the implications of these reforms within the further education sector, with particular reference to the education and training of the skilled engineering craftsman/technician.

Since 1981 the government has made fundamental and far reaching reforms into the educational system in Britain.

This report is an investigation into how this has effected skilled subjects in particular for the engineering craftsman/technician although it is also relevant to other trade areas, and by what method or methods should be adopted to teach a skilled subject.

This will be done by first looking at the historical/traditional approach through to the more modern day methods, as laid down through the various government education acts since 1981; in particular the method outlined by the then manpower services commission in 1985. This I hope will show how the present government is driving an ever increasing wedge between the academic needs and the vocational requirements that a skilled craftsman/technician needs in order to perform his/her job satisfactorily.

In 1981 the government set out in response to a report by the then Manpower Service Commission a white paper intitled, "A New Training Initiative".

From this the commission highlighted three major objectives, of which the first one made particular reference to how the British skilled engineer should be trained and educated, *"to develop skill training including apprenticeship in such a way as to enable young people entering at different ages and with different educational attainments to acquire agreed standards of skill appropriate to the jobs available and to provide them with a basis for progress through further learning"*.

The then secretary of state for employment whilst giving support to this report with a ten point program for action, from point five we can start to see the development of the government beginning not to recognise just what the requirements are that are needed for a skilled workforce. Point five stated, *"setting a target date of 1985 for recognised standards for all the main craft, technician and professional skills to replace time-serving and age-restricted apprenticeships"*.

It is not so much the wanting to end apprenticeships but what they were to be replaced with from 1985 that this investigation is mainly concerned with.

From the 1986 white paper, Review of Vocational Qualifications in England and Wales the government set up a new body that is to be responsible for the setting up of vocationally based education and training, this body is known as the National Council of Vocational Qualifications, (N. C. V. Q).

This policy was updated in 1988 with the new educational act, which will be investigated in part four of this report.

Before going on to see how a skill was taught before 1981 and after, we first need to explore the concepts, and find a definition as to just what constitutes a skill as regards a particular discipline such as that of the engineer.

The government as this year brought out a new white paper, with the likelihood

that this will be followed by a new education act. The implications of this new policy being to recent to comment on, and I leave it up to the reader to follow this new policy to see what effect their will be on education following this report.

Section Two: What Constitutes a Skill

From the Oxford Dictionary skill is defined as, “Expertness, practised ability, facility in an action or in doing, or to do something dexterity, tact”. This does not really give one a very satisfactory definition, so let's see how some other people have defined what constitutes a skill.

Borger, R and Seaborne, skill is defined as, *“skill should be regarded, not so much as a particular range of activities, but rather as an aspect of all forms of behaviour”*. (1)

B.F. Skinner, has this to say on the subject of a skill, *“extremely complex performances may be reached through successive stages in the shaping process, the contingencies of reinforcement being changed progressively in the direction of the required behaviour. The results are often quite dramatic”*. (2)

The above two statements I feel do not really define what a skill is as regards a largely practical subject, such as workshop engineering.

I feel therefore that a more accurate definition of a skill is to have the ability not only to perform something positive with the hands, but also to be able to back this up with sound scientific knowledge, any thing less than this is no more than an ability or aptitude.

The definition of a skill will be further explored in section four of this report.

The definition that I have advocated as to just what constitutes a skill when applied to an engineering/technician not only has to have the ability to perform a manual task, but is also able to quantify in scientific terms why they have chosen a particular method, but to also have the ability to work with the minimum amount of supervision in the minimum amount of time.

This definition is more in line with the thinking of a report in 1979 by the committee of inquiry into the engineering profession, which stated that engineering graduates have to be and need to be trained once appointed to a job.

I therefore feel that to describe a skill as any thing less than a practical outcome supplemented with scientific knowledge is nothing more than an ability or aptitude.

In the next section we will explore by what educational methods before 1981 were used to teach a skill, as outlined at the end of the last section, then in section four we will explore the teaching of a skill since 1981.

Section Three: Pre 1981 Teaching a Skill from Dewey and Pragmatism, Skinner and Behaviourism

As already mentioned at the start of this report in 1981 the government started on a series of major educational reforms in the F. E sector, to see how these may or may not conflict with the educational system that went before, we will first explore the relevant theory and teaching methods that were then in vogue especially as regards the teaching of skill based subjects.

Two of the main theories that dominated this area of teaching were Dewey's pragmatic approach and Skinner's behaviourist theory of learning.

For the subject of engineering from the production floor through to the research laboratory is one of mainly problem solving, where one has to rely on three areas of knowledge:

- 1) Theoretical knowledge _____ from science
- 2) Heuristic knowledge _____ from experience
- 3) Knowledge of tools and techniques _____ from training and practice

It is the combination of the above three areas of knowledge that the aforementioned theories of teaching actively promote through a succession of student personal development through the adoption of the initiation-response-feedback method coupled with rote learning.

One of J. Dewey's statements on education gives a good philosophical reasoning behind this, *"History of education theory is the opposition between the idea that education is the development from within and that it is formation from without; that it is based upon natural endowments and that education is a process of overcoming natural inclination and substituting in its place habits acquired under external pressure."* (3)

From Skinner's behaviourist theory he had this to say on the teaching of a skill, *"Extremely complex performances may be reached through successive stages in the shaping process, the contingencies of reinforcement being changed progressively in the direction of the required behaviour. The results are often quite dramatic."* (4)

The above two approaches outlined above are very much concerned with the students or learners, and the way in which he/she assimilates knowledge. This was done by recognising that in order to learn the learner first needs a body of knowledge on which to build on quite often referred to as core skills or knowledge.

The way that this core knowledge was presented to the student on the academic side of their required knowledge, was at the beginning of their studies through a structured series of largely didactic lectures, with assessment through a system of carefully closed type questions, this is known as rote learning. The first exam that the students were likely to sit reflected this method of teaching and learning by being multiple choice papers.

It was only after the students had become proficient in the use of basic skills would they then go on to build on these.

This was done by slightly changing the teaching method and allowing the student some self expression through problem solving. The lectures would begin as before with didactic teaching, but would then be opened up by getting the students to solve relevant problems from the information given. Assessment was now on more open type questions although closed questions were still used, again the exam followed this type of procedure with a structured system of open and closed questions.

For the students practical acquisition of workshop skills, again the above types of teaching were adopted although they were changed slightly to reflect that the

student was learning how to use their hands.

This was first done by giving a demonstration to the student/s in a workshop setting, with may be a short didactic lecture first to explain some of the relevant theory behind why this particular method or methods are adopted for a given practical out come.

The way that these two methods were applied were either through the apprenticeship/academic route or the academic/apprenticeship route.

Before 1981 the route that a student engineering craftsman/technician would of taken to become fully qualified in there profession, was a well defined one through the apprenticeship system.

The particular route he/she would of taken being very much dependent on the particular requirements of the company that was sponsoring them. (5)

They would either start of as an apprentice craftsman or technician and gaining the relevant qualifications in there subject area may well of been given the opportunity to scale the academic ladder to all the way to degree level. The other route was to gain A-levels and then to obtain a degree then on entering a company they would of been given a mature apprenticeship at technician level.

Section Four: Government Policies Since 1981, and R. Johnathan's Manpower Services Model of Education 1985, R. Barrow AND M. Griffiths 1987

From the 1981 government white paper, A New Training Initiative, see page one, one of the first things to come out of this was the establishment of the amalgamation of the Business Council, and Technicians Council in to one body, the Business and Technicians Council,(B/Tec).

This new awarding body abolished the old O.N.C's and H.N.D's etc, and brought in new courses that were to be academically and competence based. This was in order to fit in with the new way of thinking then coming in by the government.

The B/Tec council being formed from purely academic councils had and is still having great difficulty in combining these two elements into their courses, with in practice much more emphasises being placed on the teaching of the relevant theory, and not being able to relate this to the more practical side of engineering etc.

Also they started to initiate a new style of teaching, which moved away from the traditional methods as outlined by Dewey and Skinner etc, to a more student centred approach. This as now come to be known as student-centred learning.

This method led to the adoption of assessing the students through assignments and phase tests for both the academic and practical sides of engineering courses.

The council taking over purely academic courses could not and still does not appreciate the time that is needed in order for the students to gain the necessary skills in a workshop situation.

This was highlighted by one of the original lectures of B/Tec courses N. Burrows in 1983 in his textbook Manufacturing technology Level II, of which he has this to say, *"very few student groups even when specially recruited for a particular class, are able to proceed at a common pace of study which suits every member of the class. The hours available to cover a TEC unit are barely adequate and so the*

more time consuming aspects such as practical work, receive only a cursory treatment, or even worse, are omitted altogether, similarly phase testing and assessment are often regarded as a means of gauging the students success or failure rate and no feedback is received of the effectiveness of the teaching nor of the depth of learning.”

From 1981 to 1984 the then manpower services commission in conjunction with the government worked on a new model for the education and training for students entering the engineering industry. (6)

The most fundamental believe to come from this was a new philosophy that states that somehow education and training are two totally separate identities of knowledge, with no common links existing between them.

This is to say that education is a purely academic entity with no visible practical signs to show from its use, whilst training is the complete opposite, being only able to show some positive practical outcome.

The new model to emerge in 1985 was investigated by R. Johnathn (7), and substantiates that stated above that skills can only be obtained through training and must be defined by industry.

The main points to come from this model as indicated in this article are:

- 1) Education to be industry led
- 2) To be consumer led
- 3) More competence based training
- 4) Education to be more student centred learning
- 5) Education and training should be conflated

From this model the most relevant point to emerge from it is point five which shows that education and training are not equatable according to the Manpower Services Commissions model, that is to say that they are two separate things. This will be explored more fully in the next section.

In order to implement this new model a new body was set up by the government, the National Council for Vocational Qualifications (N. C. V. Q).

This body is not an examining body, which sets up its own syllabuses and instructs educational institutions how they should be carried out etc, Instead they are to lay down what they see as the requirements for vocational training for a given occupation, then the traditional examining bodies like City and Guilds etc, are to make their courses fit in with this structure. Once this is done their course will be given the seal of approval by the N. C. V. Q council.

From section B, part two of R. Jonathan's article we see that education is to be consumer led, the consumer being industrialists, employers and the state. This has led to much wider powers of influence over the way the new competence based courses are not only to be taught, but also in the way they are to be assessed, to the major industrial employers, and the role of the student/learner to be that of just a pawn in the system, R. Jonathan comments thus on this point, *“The assumption that educational change should be consumer led (B2) is a proposal to regard the individual primarily as a cog in a given socio-economic machine, and the education system as an arm of the Manpower Services commission.”*

The philosophy that skills and knowledge are two separate identities is further supported by R. Barrow (8), and M. Griffith (9), in 1987.

R. Barrow argues that the concept of skill is in its very essence a very complex one with their being no real precise definition. From his argument it is seen that he is trying to define a skill as largely non-educational, by trying to find links between natural inherent ability to blink ones eyes, or to acquire the ability to ride a bicycle being both skills.

M. Griffith in answer to R. Barrow is equally confused, but does come a little closer to just what constitutes a skill, and states, *“Typically one side of the argument leans on the notion of practical activities being 'mere skills' that do not require much rationality or use of reason. They are thought to be necessary only in that they allow human beings to pursue the more intellectual life. A political system in this argument should either have a mental/manual division of labour, as in Plato's republic, or it should allow everyone to do as little practical activity as possible in favour of higher things. People should be freed of manual labour and domestic tasks as far as possible.*

The opposite side of the argument leans on the notion of practical activities as being skilfully done. In this view skill is thought to be something that requires the full use of human faculties. Physical, mental and moral, and so is something that should be highly valued in human beings. A political system in this argument should value all practical activities, and would assert the dignity of labour, and the value and importance attached to domestic work, over and above 'mere intellectualising’.

The above philosophy that education and training are separate identities is very much advocated by N. V. C. Q which incorporates much of the M. S. C recommendations for the education and training of the workforce in Briton, where they believe that vocational education can only be undertaken within the workplace. (10)

As already mentioned this has led to a lot of influence and power being given to industry, for it is industry lead bodies that inform N. V. C. Q just what competencies they require for a give occupation.

N. V. C. Q's are to consist of the ability to carry out a specific work based task, with the student being able to understand the underlying knowledge behind the task.

N. V. C. Q then informs the existing examining bodies what these competencies are, they then have to re-design their course curriculum to suit.

Their is no provision for educationalists on these lead bodies, so it is difficult to see how N. C. V. Q can assess the relevant underlying knowledge of their given competencies.

This power was further extended in 1988 when from the governments white paper, Employment for the 1990's, with the setting up of the new Training and Enterprise Councils, (T. E. C's).

T. E. C's are local councils who are to be responsible for the training of young people within a given geographical area. Initially their is to be one hundred of these councils in England and Wales, and they will be fully operational from 1992. The boards of the T. E. C's will consist mainly of members from local companies, with no provision for members from local colleges to be included, they will therefore decide within their geographical area just what education and training they require for their respective industries etc.

The T. E. C's will work with N. V. C. .Q in deciding what they consider to be the relevant competencies a particular occupation will require and how it should be

assessed. The assessment is to take place where possible within the workplace, or within a simulated working environment. As already mentioned the existing examining boards will have to bring their existing courses into line with these requirements.

A student now entering engineering will no longer have to seek an apprenticeship from an employer, so is therefore no longer restricted by age.

To obtain a N. V. C. Q certificated course a student no longer has to start a course from the beginning but may be able to get credit through acquired prior learning that exempts them from specific components. They therefore no longer have to start from the beginning, but can do the required components in their own chosen order, in order to achieve their desired or more specifically the desired qualification of a given company or T. E. C who are sponsoring them.

Also the new courses are to be modular in structure, which is to say that a student can choose what parts of a course, and in what order he/she will study them. This will be decided for the student if they are being sponsored by either a local company, or the local T. E. C.

The assessment procedure is to take place in the workplace or a simulated working environment.

The consequences of the above for a student now entering engineering, are that they no longer go through a systematic structure of knowledge to give them the necessary academic ability coupled to their practical skills.

Section Five: Are there any Common Links Between Dewey/Skinner and Johnothan/Barrow/Griffith and The Educational Models they Propose for the Teaching of Skills

As seen from the first model before 1981 there was very much more emphasis on the student as a learner.

This was recognised through the system of education and training he/she would have received then, by being in full time employment learning the everyday side of a given trade, or occupation. In conjunction with this they would attend a college of further education in order to learn the more academic and scientific principles that lay behind their trade.

Both the practical and academic sides of their studies was laid down in a systematic manner. They would start from the beginning with no knowledge assumed, and through a well structured syllabus would be instructed and educated through a layered body of knowledge that built upon that already given, very much how a house is constructed.

Once a student or more pacifically an apprentice had been through this route, and had become say a qualified mechanical fitter, he/she was equipped with a very broad based education that would allow them to move from one company to another that may have been in a totally different area of the manufacturing industry. When on entering their new company they would not have required any new training in order to carry out their duties.

As seen from the second model a student no longer has to start from the beginning but can join a course at any stage to gain accreditation for a particular N. V. V. Q. component.

The consequences of this I hope the reader will see are that the student no longer has to study a complete course that requires a large amount of attendance at a college etc, and that if sponsored by a local company will only be able to gain the

components the employer feels are relevant to his/her immediate needs.

The student will therefore no longer be given a broad based education/training upon which they can later expand upon through out their career as it develops. This is like giving to the students before 1981 a coat stand consisting of their basic knowledge on which they had plenty of room to hang new skills as they required throughout their careers, and for the students after 1981 a coat hanger upon which they could hang new skills upon later on in their career.

I hope that the reader can see and agree that one can store and hang a lot more coats on a coat stand than on a coat hanger.

As we have also seen there is a fundamental difference between the two models in the way they are to be taught, the first model is very much student centred, with the knowledge being given to the student through rote, and initiation-response-feed-back teaching methods.

The second model sees the student as only a cog in the system and a very small cog at that, with instruction being given by mainly the student centred learning approach.

The other difference between the two models is that the first recognised training to be equatable with education, whereas the second does not, with also the first having a better appreciation and understanding of what constitutes a skill.

I therefore feel that the only common ground between the two models are that each in their own way are trying to give the necessary and relevant skills to the students that industry requires.

Section Six: Conclusion: What are The Implications of Adopting the M. S. C Model of Education for Students and Teachers

I hope the reader can see that by adopting the new model we have indeed come somewhere to deskill the British workforce, and that I have achieved the main of what I set out to do at the beginning of this investigative report.

The consequences and implications for a student now entering engineering, are that they can no longer expect to receive an apprenticeship from a local company. If they are sponsored by a company the training and education they do receive will be very much dictated by the company, and will be confined to only those areas training that the company feels is relevant to its immediate needs. This will leave the student not having the ability that they were given before 1981 of moving to another company, and being able from day one to fit in and produce what the company manufactured.

The consequences of the new model for teachers in further education are that with the new model they may no longer be required, due to the fact that the new N. V. C. Q's can be obtained entirely in the workplace. It may therefore be necessary for the colleges to contract out certain members of their staff as assessors to meet the assessment requirements of local companies.

Also all those concerned with the teaching of skill based subjects who were brought up under the old traditional system will have to re-educate themselves as to just what a skill is as perceived by the M. S. C model of education/training and by what methods it should be taught and assessed.

The implications of the new modular structure to courses means that students

must be given the facility to join a course, and start which ever part he/she desires at any time during the year.

The consequences of this for teachers/lectures in vocational education are that the old academic year is over, with courses no longer starting in September and finishing in July. This means that they will no longer enjoy a six week break in the summer, but will be expected instead to stagger their annual holiday entitlement to fit in with the colleges new educational structure built around these types of courses.

Also they will have to be retrained in how to cope with a fluid course in facilitating students who will all have different educational needs and outcomes.

This report is best summed up with the wise words of Sir George Cayley who in 1839 recognised the dangers of leaving education and training of engineers into the hands of those who are not acquainted with the profession, when he said this about the board that was to set up and run the first Polytechnic Institution in England, "*a good scientific board confined by no aristocracy or orthodox men who sit like an incubus on all rising talent that is not their own shop.*"

Notes:

1. R. Borger and A. E. M Seaborne, *The Psychology of Learning*, Penguin 1966
2. B. F. Skinner, *The Science of Learning and the Art of Teaching*, in *stones*, E(ed). *Readings in Educational Psychology*, Methuen 1970
3. J. Dewey *Experience and Education* 1938
4. B. F Skinner, *The Science of Learning and the Art of Teaching. From Stones*, E (ed). *Readings in Educational Psychology*, Methuen 1970
5. *Block or Day Release? A comparative study of engineering apprentices*, B. M. Moore, *National Foundation for Educational Research in England and Wales* 1968.
6. *1981 White Paper a New Training Initiative: A Programme for Action*
7. *The Manpower Services Model of Education*, R. Jonathon, *Cambridge Journal of Education*, Vol 13, No 2 1983
8. R. Barrow, *Journal of Philosophy of Education*, Vol 21, No 2 1987
9. M. Griffith, *Journal of Philosophy of Education*, Vol 21, No 2 1987
10. *The P. E. C. T Sector, Policies and Issues*, *Thames Polytechnic Handbook* 1991-1992, pages 59-63

FURTHER READING

SECTION ONE

1981 White Paper, A new Training Initiative: A programme for Action

1984 White Paper, Training for Jobs

1985 White Paper, Employment: the Challenge for the Nation

1985 White Paper, Education and Training for Young People

1986 White Paper, Working Together- Education and Training

1988 Education Act

1988 White Paper, Employment for the 1990's

M.S.C Corporate Plan 1984-1988, MSC Publications 1984

The P.E.C.T Sector Policies and Issues, Thames Polytechnic Handbook 1991-1992

SECTION TWO

Principles of Learning and the Practice of Teaching, Thames Polytechnic handbook 1991-1992

SECTION THREE

A Social History of Engineering, W. H. G Armytage, Faber and Faber Ltd, 1961

Industrial Biography (Ironworkers and Toolmakers), S. Smiles 1863, Reprinted David And Charles Ltd 1967

History and Development of Engineering, M. S. Gregory, Longman 1971

SECTION FOUR

Towards a Skills Revolution, C.B.I Report 1989

G. Jessop, Outcomes N. V. Q's and the Emerging Model of Education and Training, Falmer Press 1991