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Pupils Attitudes Towards Technology
Technology Education and Research: Twenty Years in Retrospect

Conference Paper Submission of

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Paper Title:

Technology Education in Scotland: an Investigation of the past twenty years.

Introduction

The evolution of technical education in Scottish schools over the last twenty years, I will argue, follows two contiguous rationales. The first, which has been engineered by policy makers, developed out of a post war curriculum which insisted that the concern of technical education should be the acquisition of a limited set of broadly based mastery skills, designed specifically to correspond with the perceived needs of industry at that time. As the nature of technology has changed over time, however, so too has the thinking behind, and the rationale for, a technical (technological) education. A new technology curriculum has consequently evolved. This incorporates at its heart, the overarching concept of "technological capability" defined as:

"…understanding appropriate concepts and processes; the ability to apply knowledge and skills by thinking and acting confidently, imaginatively, creatively and with sensitivity; the ability to evaluate technological activities, artifacts and systems critically and constructively' (SCCC, 1996: 7).

Twenty years ago, therefore, it had become apparent to policy makers that radical changes were required to bring the technical curriculum into line with the rapid technological developments occurring at both national and international level.

The second rationale, which has been engineered by teachers, has exactly the same origins as the first. It has, however, essentially failed to evolve at all, and thus represents a technical educational in stasis. This second rationale, which follows the same time continuum as the first is, I will argue, the result of the poorly supported imposition of change through innovation embedded in the former model and the consequent resistance of teachers to this imposed change.

In this paper, I will explore the evolution of the technical curriculum in Scotland over the past twenty years. I will explore the development of policy and its application within the context of the classroom. Though a consideration of the tension that exists between policy and practice, moreover, I will reveal the twin rationales referred to above. But first, I will situate the field.

Pre 1984: The origins of technical education in Scotland

The industrial revolution regarded technology as a "system of mechanical and industrial arts" (Murphy and Potts, 2003. p3; Volti, 2001). It was during this period therefore that the term became closely associated with systems involving machine technology and the technological processes used in industry. Through this association, the concept of technology became inextricably linked to economic development as the engineering industry expanded. It is likely that the propinquity of technology with industrialisation served to establish the first chair of engineering in a British university; that university being Glasgow in Scotland (Ashby, 1959). Clearly, new techniques were required for the operation of these new industrial technologies, and a plentiful supply of workers, including manual workers, would have to be trained in order to operate and manage this (Dakers, 2005). In a major conference on technical education held in Edinburgh in 1868, this very issue was discussed and the following decision made:

“The time has arrived when it is desirable and necessary in the education of the people that the principals of science (and technology) (*sic)* should form an important element in the tuition of all classes of the community” (Conference, 1868)

A new industrially oriented world order sought a new ‘technical’ education which would serve the needs of these new and expanding industries at shop floor level as well as in more “elevated” positions.

Technical education in Scotland therefore has a long pedigree which was, and I will argue still is, considered to be the initial training ground of a future workforce for industry, particularly engineering. As far back as 1890, technical education was defined as “instruction which aims at communicating to the pupils knowledge and facilities which have a direct bearing upon some special occupation, industrial or commercial” (Cowper, 1970: 47 in Paterson, 2003: 90).

Around the same time, a strong movement towards the establishment of “working class” education grew up in Scotland. Funding from the government, and more particularly the trades unions, resulted in the provision of extra mural evening classes, or continuation classes as they were known. The *raison d'etre* behind this egalitarian philosophy was very much an intention to enhance “an intellectual understanding, not just technical dexterity” (Cowper, 1970: 115 in Paterson, 2003: 92). Indeed Heriot Watt College [forerunner to Heriot Watt University in Edinburgh], although offering vocational courses, at the same time made it explicit that it sought to attract students who wished to “…rise above the position of being mere machines performing certain mechanical and routine operations in order to acquire a fair knowledge of the fundamental laws underlying the science to which they owe their livelihood” (Cowper, 1970: 162 in Paterson, 2003: 92).

The post war curriculum in technical education, however, appeared to lose sight of this antecedent philosophy, concentrating instead on a vocational orientation with a continued emphasis on craft skills in subjects such as woodworking, metalworking, and craftwork in plastics and similar materials. Allied to these subjects were skills associated with the construction industry, notably brickwork, painting and decorating, plumbing and home electricity and car mechanics. Technical drawing and building drawing were incorporated to enhance the craft subjects whilst the principles of mechanical and electrical engineering gave a theoretical underpinning to technical subjects (Curriculum Paper 10, 1972). It is in this curriculum paper that technical education is linked most explicitly with the needs of industry - an industry which was, moreover, clearly regarded as being male-oriented.

“In support of modern industry we have seen during the last twenty years a substantial expansion of day further education for apprentice craftsmen and technicians and since the passing of the Industrial Training Act in 1964 a considerable expansion of industrial training and retraining for operatives, craftsmen, technicians and technologists. … Clearly it will be an advantage if schools can produce a pupil with broad creative ability, with a flexible and adaptable attitude to industrial processes, with skills and knowledge which can be developed in several directions, and with a willingness and capability to be retrained several times during *his* working life” (SED, 1972: 3). (My emphasis).

Technology education so defined, can therefore be concerned only with the acquisition of practical craft skills specifically related to the perceived needs of industry, and generally concerned with the provision of a manual workforce trained in service to those industries. The fact that technical teachers from that time were recruited almost exclusively from trades backgrounds in industry (Dakers and Doherty, 2003), may also help to shed some light on the emphasis given in Curriculum Paper 10, to the development of a curriculum which stressed the acquisition of craft skills which were regarded as important in serving the needs of industry.

This instrumental form of technical education retained its 'industrial' orientation up until the last two decades, when it became apparent that the industrial base to which technical education had allied itself was no longer viable in what had become a technologically, rather than industrially mediated world. (Dakers, 2005)

1984: The Committee on Technology

The working party which had been constituted to deliver "Curriculum Paper 10" in 1972, was, apart from a few HMI and head teachers, almost exclusively made up of secondary school technical teachers.

In 1984, however, the constitution of the newly formed 'Committee on Technology' included one head teacher, a depute head teacher, a representative from the Scottish Education Department, a representative from the Scottish Curriculum Development Service, a major industrialist, an advisor from business subjects, a head of a physics department and significantly, only one representative from a school technical education perspective. Interestingly, another important addition was that of an adviser in Home Economics. It seems that policy in respect of the technical curriculum was to be re-defined by a wider representation who regarded technical education now to be much more than the development of industrially related psychomotor skills. This formed part of an even wider movement towards modernisation in which attempts were made to devise a curriculum more suited to the technological age of the late twentieth century. "The deliberations of the Committee on Technology coincided with the tidal wave of curriculum change…in response to rapid technological developments and to political initiatives…on the introduction of new and more relevant courses" (COS, 1985: (i))

The Committee on Technology insisted that technical education should still be seen to serve the needs of industry. It also recognised, however, that the nature of industry had undergone important change. The hitherto solid "Industrial Revolution" was rapidly being overtaken by a "technological revolution" which was evolving at an exponential rate. Technical education, had to be seen to respond to this phenomenon, and was consequently reconstituted as Technology Education, where technology was defined as being:

"… concerned with the identification of some of the material needs of man (*sic*) and the endeavour to satisfy those needs of man (*sic*) and the endeavour to satisfy those needs by the application of science and the use of materials, resources and energy. It is concerned with solving problems where there is no right or wrong answer, only good or bad solutions to a problem. Technological behaviour requires activities that are creative and demanding, where laws and principles of science, the constraints of society and economics are applied to problems to satisfy human needs. Technological behaviour involves approaches and techniques, such as systems analysis, problem identification, decision making, planning, idea communication and solution evaluation, which are more that pure science or craft" (COS, 1985: 3-4).

This represented a paradigm shift in relation to both the content and delivery of technology education. A much broader conception of technology was now evident. Whereas previously, manual skill procurement had been developed through the transmission model, usually by way of demonstration, and the required manual skills had been assessed through the reproduction of prescribed artefacts, or through assignments which had essentially right or wrong answers, this new, broader model saw problem solving as playing a crucially important part in the process. Under this model, there were no "right or wrong answers just good or bad solutions" (COS, 1985: 3). An emphasis was now therefore given to solving "real" problems rather than teacher based problems. The concept of the "design process" entered the field and took on a central role. Technological awareness was now regarded as essential for the formation of an educated democracy. Consideration was also to be given to working co-operatively with Home Economics. Opportunities for doing and learning about technology were to be considered under two headings: Technological activity and Technological awareness and appreciation (COS, 1985).

However, the links with serving the needs of industry still hung on tenaciously at the classroom delivery level, and this had the effect of reinforcing the academic/vocational divide. The distinction between technological activity and technological awareness and appreciation, moreover, together with an assessment system which put more stress on craft activity than it did on technological awareness, enabled teachers who were reluctant, or perhaps more appropriately, unable, to embrace the new technology curriculum, to subvert it back towards the old craft model.

Thus, while policy for technology education was motivated by a need for reform, teachers appeared to be in the business, for various reasons, of eschewing any new initiatives which threatened to move technical education away from the well established vocational "Industrial Arts" model which had served them so well during the post war years.

The transformation of Technical education into Technology education

The technical curriculum was transformed between 1984 and the early 1990's. Woodwork and metalwork were replaced with craft and design; technical or engineering drawing was replaced by graphic communications and engineering science or mechanics, was overtaken by a radically different new subject known as technological studies.

These new subject areas, once more, required a major shift in pedagogy - a movement away from the teacher led expert model, towards a more collaborative, facilitative and child centred approach. This model constituted a major rethinking of pedagogy across all areas of the curriculum. However, this new teaching style was completely antithetical to the style of teaching normally found in technical classrooms.

Support for teachers to help develop these changes varied in quality across different Local Authorities, especially for the very new subject technological studies. Unlike the other subjects, technological studies involved a number of new areas including “Pneumatics, Computer Numeric Control, Computer Aided Drawing, Electronic Systems, Electronic Control and Robotics” (Bain, 1999: 563). Whereas craft and design retained a large element of woodwork and metalwork, and graphic communications retained an element of technical drawing, Technological Studies was almost completely new. This necessitated the implementation of very significant changes in both the content and delivery and the consequent difficulties encountered with the introduction of technological studies in fact, led to a significant downturn in its delivery in Scottish schools (HMI, 1999: 16).

Presentations of technological studies at Standard Grade (the examinations taken at age 16) across Scotland fell from 6,076 in 1994 to 3,649 in 1999. In the same period, however, craft and design increased by over 2,000 (Dakers and Doherty, 2003: 613). The problem in uptake of Technological studies is at its most serious around the West Coast of Scotland where, for example, schools presenting technological studies in Glasgow between 1998 and 2001, dropped by 50% (Dakers, 2000), and almost 90% in 2005. (Glasgow City Council Educational Services).

1987: Initial Teacher Education in Technology Education

As previously stated, prior to 1987, teachers of technology education at secondary school had been recruited from a background in industry and had studied for a Diploma in Technical Education. A large proportion of these teachers, many of whom had been teaching a very prescriptive and craft orientated technical curriculum for some time, found it particularly difficult to deal with the sweeping modernisations that were being implemented in the 1980’s (Bain, 1999).

As part of the sweeping reforms of technological education, therefore, the Scottish Education Department decreed that teaching should now be an all-graduate profession. In 1987 the Universities of Glasgow and Edinburgh developed the first four-year degree courses in technology education. The hope was that these courses would help alleviate the worsening situation in technology education, particularly in relation to the delivery of technological studies. As is still evident each year, however, uptake of the subject continues to decline. Current research into Scottish student technology teachers’ perceptions about technology education, moreover (Dow, forthcoming), suggests that student teachers have serious anxieties about teaching technological studies. This may be due in part to the fact that there is very limited access to the subject on school placements. There also, however, appears to be some evidence emerging that student teachers regard technology education as being more related to the teaching of practical skills than the teaching of technological awareness. Significantly, there is a perception among student teachers that more is learned about the teaching of technology on school placement than on university courses. The implication of this is that teachers of technology subjects, a significant number of whom still adhere to the old skills procurement model of technology education, will continue to have a strong influence on the mindset of student teachers. Dow's finding resonate strongly with research carried out in America by Hansen (in Hansen and Lovedahl, 2004), who found a dichotomy of opinion between teachers views as to the purpose of technology education. Teachers who considered themselves as teachers of technology education, thought technological awareness and appreciation was the purpose, whereas those who saw their role as teachers of technical subjects saw career preparation as the purpose.

1993: The introduction of the 5-14 Environmental Studies Curriculum Guidelines.

The introduction of the 5-14 Environmental Studies curriculum guidelines heralded a significant change in the provision of technical education in Scotland from the earliest stage of primary to the end of the second year of secondary school. These guidelines incorporated social subjects, science subjects and significantly, for the first time at primary level, technology subjects. These were completely revised and updated in 2000.

The revised guidelines were introduced as a result of pressure from teachers who found the previous guidelines extremely difficult to follow. They were rewritten in conjunction with a primary school pack entitled "Primary Technology in Scottish Schools: Education for Technological Capability". These new study tasks, were the result of a joint project between Learning and Teaching Scotland and the Nuffield Foundation. This model for technology education delivery is supported by a corpus of research over the years. (Murphy, 1999; Barlex, 2000), and seeks to develop technological capability where "children are [seen to be] building a repertoire of design & technology problem-solving strategies whilst engaged in creative activity that makes sense to them and interests them (13). The concept of technological capability has its genesis in the SCCC position paper written in 1996.

1996 to the present: The SCCC Position Paper on Technology Education in Scottish Schools

In 1996 the Scottish Consultative Committee on the Curriculum, in association with a wide ranging panel of consultants, (although significantly once again, only one technology teacher representative in the main review), published its seminal position paper on Technology Education in Scottish Schools. This paper outlined the four interconnected aspects of what was, and still is, the underpinning concept which now informs all aspects of technological education in Scotland, known as Technological Capability. This capability is acquired through the realisation of technological perspective, confidence, sensitivity and creativity, and forms the bedrock upon which all aspects of the modern technology curriculum stands.

The rationale for technology Education in this new model:

"…involves learning about the social and physical conditions that influence, or have influenced, the lives of individuals and communities and which shape, or have been shaped by, the actions, artefacts and institutions of successive generations. Acquiring, interpreting and using evidence and information about the world they [pupils] live in is part of a sequence of discovery and rediscovery for every generation" (LTS, 2000: 3)

Once again it is apparent that the rationale for the technology curriculum has taken an ever more hermeneutic turn. Policy suggests that technology education should have less concern with the development of craft skills and a greater concern with both the interpretation of the made world, and a consideration of the impact of technologies on humans and the environment. Again, however, there is evidence to suggest that practice does not reflect policy. Teachers continue to show a reluctance to abandon the craft based model of technical education. In many Scottish schools evidence clearly indicates that for students in the first two years in secondary schools the curriculum followed is a craft orientated model where artefacts are fabricated on the basis of psychomotor skill development (Dakers, 2003). This continued emphasis on craft, therefore, belies the intention of policy for students to develop a technological capability which seeks to ensure that pupils will

"…be better equipped to live purposefully, productively, confidently and wisely in the world of today and tomorrow if they have been enabled to acquire and deploy a broadly based technological capability" (SCCC, 1996: 4).

The Primary Technology Curriculum.

The concept of technology education in primary schools in Scotland remained elusive until the early nineties. In 1991 primary education in Scotland underwent a systemic change with the introduction and implementation of the new 5-14 National curriculum guidelines programme as mentioned previously. This covered five areas: English, Mathematics, Environmental Studies (including History, Geography, Science and Technology), Expressive Arts (including Physical Education), and Religious and Moral Education. Environmental Studies, which included Technical education, was introduced in 1993. However, whilst teachers generally welcomed a structure to their curriculum and especially the detailed guidance which was offered, there were strong concerns about the ability of primary teachers to cope with the content and delivery of such a broad range of subject specific areas. This was particularly true in the case of the science and technology components (Pickard. 2003).

Prior to the introduction of 5-14 guidelines, the primary curriculum had been much more integrated and consequently holistic in its rationale. The Scottish Education Department's *Primary Education in Scotland (or The Primary Memorandum)* (SED, 1965), on which the primary curriculum was founded, had been considered quite revolutionary in its child-centred approach. The rationale had been grounded in the theory that children should be active in their own learning, that they had a natural curiosity about the world and most importantly, a natural desire to learn (Adams; Paterson. 2003). This move from a curriculum driven to a child-centred approach gave teachers a greater degree of autonomy in the teaching and learning process. This autonomy resulted in ensuring that the location of any form of technology education was the secondary sector where 'technical' education was very much about woodwork, metalwork and technical drawing, subjects which were considered to be beyond the capability of the primary schools to deliver (Dakers and Dow, 2004).

This model prevailed until the 1980's when a major survey into primary education was undertaken by the Scottish Council for Research in Education (SED, 1980). The findings of this survey suggested that, rather than the broad active curriculum proposed in the 1965 policy, in practice a very narrow curriculum had evolved. In particular, primary education was found to be delivering little or no science and technology. It was found, moreover, that contrary to the spirit of the Primary Memorandum, very little discovery learning and very little curricular integration was in fact in evidence (Adams, 2003). Another major concern related to the transfer from the primary to secondary stage where, particularly in relation to technology education:

"Significant weaknesses in primary-secondary liaison were identified with secondary teachers unable to appreciate the nature of work in primary and some primary teachers asking secondary teachers to tell them what to teach in upper primary leading to advice which was ill advised and which has had a restricting effect on the curriculum of the primary school" (Adams, 2003: 370).

The result of these findings was the creation of the 5-14 curriculum guidelines which were presented in a somewhat emollient fashion in the label 'guidelines'. This had the effect of concealing the intent of government to deliver a more centralised and prescriptive curriculum which would clear the way for the introduction of National testing. Although this emphasis on testing met with strong resistance nationally and was consequently never fully implemented (Paterson, 2003), there continues to be, notwithstanding, a strong emphasis on attainment at all stages of the curriculum. Each subject area, including technical, has a grading structure for reporting which is designed to ensure coherence, continuity and progression both within and between primary and secondary sectors. In reality, only in literacy and numeracy is this achieved. This emphasis (or lack of, in the case of technical) tends to drive the curriculum and has to a large extent, been responsible for the polarisation of the primary curriculum into separate subject domains, each with its own assessment arrangements. The effect of this has been to ensure that technical education, which has always been a controversial subject within primary schools, is perceived as a problematic subject area for primary teachers to deliver. This is further compounded by primary teachers' perceptions and confidence in relation to teaching the subject.

Recent research into primary teachers confidence in the delivery of technology education in Scotland (Dakers; Dakers and Dow, 2001; Dakers and Dow, 2004), for example, revealed some serious problems in this respect. A major problem lay in establishing a precise identity for technology education. This appears to elude most primary school teachers, and it might be argued, secondary school teachers also. Research carried out by Dakers and Dow (2001; 2004) found, for example, that primary teachers, and significantly, secondary teachers, were not familiar with the SCCC (1996) Position Paper which has been shown to form the bedrock of technology education in Scotland. Indeed most were unaware of its existence. There was, moreover, uncertainty on the part of primary teachers regarding the precise content of the secondary technology curriculum, with most being unable to even make a clear distinction between science and technology. Most had had no experience of technology education, either in their initial teacher education or in subsequent continued professional development. This reinforced findings by Eggleston, who further suggests that this is not confined to teachers, but that bewilderment over technological education is prevalent among parents, employers and the public at large. (Eggleston, 1994: 20).

This is not altogether surprising. As has been demonstrated, the rationale for technology education has changed considerably over the last twenty years. Traditionally it was predominantly craft based, non academic subject for boys only, prescriptive in its delivery, involved learning to operate industrial type machines, learning engineering based technical drawing and for the more able, mechanics. Girls on the other hand were taught domestic science. Boys were effectively being trained towards trades while girls were trained in the art of homemaking.

The ghost of this perception has faded but has not entirely disappeared. It is axiomatic that, for a significant proportion of both primary teachers, and secondary teachers of the subject, the old model still applies. The idea of the design and creativity paradigm, incorporating at its centre, the notion of technological capability, is not evident to them. This may go some way towards explaining the apparent fears, or at least anxieties, that many primary school teachers express towards this area of the curriculum. (Dakers, 2001)

If the 5 - 14 technology curriculum, incorporating the philosophy of "Technology Education in Scottish Schools" (HMI, 1999), which centres around the concept of technological capability, is to be delivered effectively, then primary teachers will require to undertake development in the pedagogical issues relating to technological capability. An insight into the aims and objectives, or philosophy of technology education and its delivery, is suggested as a requirement, preceding technological subject knowledge and methodology.

Transition from primary to secondary

The problem of achieving curricular continuity for pupils in the transition from the primary to secondary sector is one which has exercised the minds of both educationalists and policy makers for many years. Although as early as 1931, the Hadow Report on Primary education clearly highlighted the importance of continuity within the education system, the emphasis of subsequent reports on the same theme (Plowden, 1967; Bullock, 1975) and the existence of a body of literature, including 5-14, all serve to emphasise the problems of transition (Dakers and Dow, 2004).

Several factors affecting the success of transition from primary to secondary school in relation to curricular continuity have traditionally been identified. These include: the existence of effective liaison procedures; a knowledge and understanding on the part of both sectors about the respective courses taught, programmes of work and teaching methods adopted; a willingness on the part of secondary teachers to value the work done in primary schools and to trust the primary teachers' judgements in terms of assessment, along with a willingness to use the information to provide a starting point appropriate for each individual pupil (Nicholls and Gardner, 1999). Secondary teachers must also have commitment to a curriculum which builds upon the knowledge, understanding and skills appropriate to their subject which pupils have already acquired.

Whilst these factors are clearly important in all areas of the curriculum, it is perhaps in the area of the Scottish technical curriculum that the least progress in affecting a successful transition has been made.

In terms of continuity, coherence and progression, the report “Achieving Success” (HMIa, 1997) which reviewed the provision in S1 and S2 in Scottish secondary schools identified a particular problem with those areas which were regarded as presenting particular challenges in relation to course design. In the area of technical education in particular, the ways in which the course had developed in secondary schools since its introduction in 1965 had resulted in difficulties in establishing continuity between the primary and secondary sectors. This was an issue which clearly needed to be addressed.

At secondary level, there were further problems. The third “Standards and Quality in Scottish Schools Report (HMIb, 1997) identified important weaknesses and unsatisfactory attainment levels in technology in over 65% of Scottish secondary schools. Clearly, despite the introduction of curricular guidelines, the problems associated with curricular discontinuity between the sectors remains an issue (Dakers and Dow, 2004).

In March 2002 a seminar was held on technology education in Scotland. A conclusion which arose from this was that the greatest and most urgent need in technology education was for support and guidance within the S1/S2 curriculum at secondary level (The first two years at secondary). It was also concluded that a stronger emphasis should be given to creativity and that stronger links with ‘education for enterprise’ should be established. The result of this initiative was the formation, in 2004, of the Technology Education and Enterprise in Scotland (TEES) project. This aimed primarily at the S1/S2 curriculum, although it also considers aspects relating to the transition from primary to secondary school. The rationale is to encourage pupils' development of knowledge, skills and attitudes in the context of technology and enterprise. Pupils will be expected to engage by learning through, learning about, and learning for enterprise education. The work builds on the success of the “Primary Technology in Scottish Schools” pack mentioned previously.

The Secondary Technology Curriculum

The secondary technology curriculum has seen some major changes since 1984. The introduction of the 5-14 Environmental Studies course guidelines, which incorporate technology education, was intended to forge stronger links between the two sectors, as well as offering a more holistic technology education with an emphasis on technological capability. Thus, the first two years (age 12 to 14) of secondary schooling under this system requires that all children encounter technology education in which the single desired outcome listed, is that of developing technological capability (LTS, 2000). However, as reported by Her Majesty’s Inspectorate (HMI, 1999), the secondary sector was seen, yet again, to continue to deliver a craft based curriculum, based upon a ‘fresh start’ approach at entry level. The rationale for this approach, as given by secondary technology teachers, was that they did not trust the work their primary colleagues were able to deliver in respect of technology education, and they needed to start developing the skills required for the Standard Grade examinations which would follow in four years time. (Dakers and Dow, 2001)

The Standard Grades follow a two year cycle (age 15 to 16) and follow on directly from the 5-14 programme. They supersede the antecedent ‘ordinary grade’ courses set in the early eighties, where the subject area of technical drawing evolved into graphic communication, integrated craft work became craft and design and engineering science or mechanics became technological studies.

In 1992 the Howie report on the upper level of secondary was published. This included a full analysis of the Scottish education system as it applies to the post sixteen age band. This report precipitated a radical overhaul of the higher school provision. The ‘Higher Still Development Unit’ was formed and they undertook many wide ranging consultations involving schools, colleges and employers. The result of these consultations was the introduction of a new set of courses for the upper secondary stages which were designed to be more inclusive and cater for all abilities.

The aim of the Higher Still framework was to make provision for groups of pupils who were not catered for by the former Scottish Higher examination system which had, what was considered to be a very narrow range of subjects on offer. The intention was to establish a coherent post-16 curriculum that provided routes for progression (Dakers and Doherty, 2003). Moreover, a new structure was developed whereby different entry levels would accommodate a much wider range of pupils. The levels ranged from ‘Access’ levels which were very basic courses, through Intermediate 1, then Intermediate 2, Higher and culminated in Advanced Higher. Students could enter at a level which best served their needs. Courses offered in technology education followed on from the Standard Grade subjects.

Since the start of the consultation process in 1996 further developments have occurred which have a direct bearing on the provision of technology education. The last few years has witnessed some Local Education Authorities replacing Standard Grade courses for Intermediate courses. The rationale for this is that they are considered to be a more modern equivalent, are thought to articulate more closely with the 5-14 programme, and allow students to enter at levels more suited to their ability from the earlier age of 14.

The subject of Craft and Design was considered to be out dated and the new subject “Product Design” was introduced in 2004 to replace it. This course is offered at Intermediate 2, Higher and Advanced higher and is designed to

“… help develop creative, flexible learners who are able to work autonomously, to achieve good quality, feasible proposals or outcomes through active experiences of product design. At its heart is creativity. The Course develops an ability to apply skills and knowledge in different situations — attributes which are becoming more and more valuable to individuals and organisations” (SQA, 2004: 4).

This course has much less emphasis on practical craftwork and has, as stated above, a very strong emphasis on the development of creativity. This has, however, caused a great deal of debate amongst the teaching fraternity. A very strong contingent of technology teachers are opposed to the lack of craft skills in this new course. (Evidenced from electronic technology education smart group discussion forums related to Higher Still development)

Another significant development for technology education arising out of the consultation process was the development of a new subject called Practical Craft Skills. The consultation, which included input from Further Education colleges and industry, and particularly technology teachers, revealed a need for a subject area which catered for students who, it was argued, might struggle with what was considered to be the more academic processes involved in design.

"This course will contribute to the knowledge, understanding and practical experience of candidates whose aspirations and abilities are towards practical work, or who are considering a career in an industry that involves practical activity in any capacity (SQA, 1999: 5).

1999: The introduction of Practical Craft Skills

Practical Craft Skills was introduced into the Scottish curriculum in 1999 at Intermediate 1 and Intermediate 2 level.

Practical Craft Skills is offered as part of the technology curriculum and currently, covers two areas; Woodworking Skills and Engineering Skills. It is important to establish at this point that the pedagogy underpinning the teaching of Practical Craft Skills has accommodated a quantum shift back to the pre 1984 model.

"There is no opportunity for proactive problem solving, as all decisions about artefact, dimensions, order of processes, and to a large extent materials are made for the pupils. Decision making is kept to an absolute minimum and problem solving seems none existent at this particular level. The learning process is hierarchical, with the process of manufacture broken down into small, manageable steps" (Dow, 2005: In press).

Practical Craft Skills is perceived as filling a niche market for disaffected pupils, along with pupils who are regarded as less academically able; the children who would perhaps have left school in the past without any Standard Grade qualifications. A substantial number of technology teachers in Scotland feel that children are not able to deal with design, (perceived as being the academic element of Craft and Design), and are, as a consequence, opting for Practical Craft Skills (Dakers, 2003).

Conclusions

The past twenty years have seen major curriculum reforms in technology education at policy level. However, the resistance of teachers to the adoption of these changes remains and has remained constant over the years. Thus the two contiguous rationales remain. The continuation of a pedagogy that is founded upon behaviouristic ideologies, coupled with the determination of a significant proportion of teachers who doggedly persist with a craft skill based curriculum, and who refuse to engage with the concept of technological capability, seems set to continue to determine the shape of the technology education curriculum in Scottish schools.

In addition to this there are indications at post 5-14 level, that policy may be reverting to a more firmly entrenched industrial model. The Scottish Executive, for example, has given support to the recent introduction of “modern apprenticeships” in which sixteen year old school students are offered introductory apprenticeships in various trades. In a drive towards widening choice, moreover, the Scottish Executive is currently encouraging Further Education colleges to offer subjects which schools are unable to resource. These may in the future include courses in car mechanics and other engineering related skills which colleges are in a better placed to provide.

As long as Technology Education within the Scottish school curriculum persists in resisting the adoption of modern policy reforms, and continues to predominantly align itself with the notion that its purpose is the provision of a workforce suited to industries needs, it is likely, therefore to wither on the vine.

If on the other hand, it is to be recognized that design, innovation and creativity, realised through the development of technological capability, constitute the Technology Education bulwark, then the vocational paradigm must be removed from the citadel and the true purpose of Technology Education in a modern democracy restored. That purpose must be to help the formation of ‘creative’ citizens in a technologically mediated world by introducing them to a Technology Education environment which assesses, develops and encourages the essence of the child’s creativity rather than the product of the child’s labour. This will require a strong lead and adequate support from policy makers, more so than has previously been the case.

Dewey argued a convincing case for this over one hundred years ago.

“Its [technology education] right development will do more to make public education truly democratic than any other agency now under consideration. Its wrong treatment will as surely accentuate all undemocratic tendencies in our present situation, by fostering and strengthening class divisions in school and out…Those who believe the continued existence of what they are pleased to call the ‘lower classes’ or the ‘laboring classes’ would naturally rejoice to have schools in which these ‘classes’ would be segregated. And some employers of labor would doubtless rejoice to have schools, supported by public taxation, supply them with additional food for their mills…[Everyone else] should be united against every proposition, in whatever form advanced, to separate training of employees from training for citizenship, training of intelligence and character from training for narrow, industry efficiency” (Dewey in Apple and Beane, 1999. p50)

Perhaps it is finally time to listen.

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