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Hughes, C, Bell, D and Wooff, David (2011) Reducing the practice gap between the design and technology curriculum and the needs of the textile design/manufacturing industry. PATT25 Conference Proceedings . Goldsmith's University, London, England, pp. 457-465. ISBN 978-1-906897-10-9

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Reducing the practice gap between the design and technology curriculum and the needs of the textile design/manufacturing industry

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Key words:

design and technology, textiles, grounded theory methodology, teachers' perceptions of technology, practice gap

Abstract

This paper discusses the potential practice gap between design and technology needs for a progressive creative society and the perceptions of teachers who work within it. The study, based on work carried out in North West England, compares the viewpoints of two sources;

textile technology industrialists who are expert in the fields of high performance textiles, medical textiles, geo-textiles and apparel manufacturing,

design and technology teachers who have responsibility for the delivery and content of textile technology within schools and sixth form colleges.

Previous work in this ongoing study has examined the changing nature of textile technology in modern industrial societies and the perceptions practising teachers have about STEM (Science, Technology, Engineering and Mathematics) applications within the textile technology field, and how these relate to their own 'theories-in-use' about design and technology teaching and learning.

Constructivist grounded theory has been chosen for the research as a whole because its concurrent data gathering and analysis approach allows outcomes from each phase of the study to define the purpose and direction of subsequent research. Thus, this research has been informed by findings from previous work on the role of textile technology and its relationship to modern industrial and design practices (see Hughes et al. 2010; Hughes et al. 2011).

This paper describes the purpose of the work and its relationship to design and technology factors such as the needs of modern industry and STEM issues. Details of the constructivist grounded theory approach are briefly discussed and outcomes considered in terms of data gathering methods. Data from the two groups of respondents i.e. industrialists and textile technology teachers are compared to identify the practice gap that may exist between the needs of a progressive, creative textile technology industrial sector and aspects of the technological curriculum which are delivered at the school level. Findings indicate that there is a shift away from textiles teaching based on technologically oriented applications to one predominantly based on art and design. However, it is argued that STEM aspects should underpin design aspects of the textile curriculum to make it applicable to the needs of an advanced and sustainable textile industrial base.

Introduction

This paper discusses the potential practice gap between design and technology needs for a progressive creative society and the perceptions of teachers who work within it. The work is part of an ongoing study into the significance of design and technology in the English schools' curriculum and how this may be influenced by current and future political, economic and educational thinking. Recently, the status of design and technology in the English schools' curriculum has begun to be questioned by a number of governmental, industrial and educational commentators. Issues include a drive towards the introduction of an English schools' Baccalaureate (EBacc) in secondary schools, which when fully introduced will be awarded to pupils who secure good GCSE grades in English, mathematics, the sciences, a modern or ancient language and a humanities subject such as history or geography; the recent removal of design technology as a core subject in the English National Curriculum at Key Stage 4; and a 50% cut in those training to teach design and technology at the initial teacher training level.

As design and technology educators we take issues with many of the arguments that question the nature of design and technology in the English schools' curriculum and in this paper we argue the pressing need to retain the essential features of the subject in order to provide a broad and balanced schools' curriculum and prepare pupils/students for the technological world in which they live.

The research forms part of an ongoing study into the significance of design and technology in the modern schools' curriculum and how this may influence the future characteristics of the subject. Previous publications have focussed on the changing characteristics of textiles technology in modern times and how this should inform the design and technology textile curriculum (Hughes et al. 2010), and examining practising design and technology teachers' attitudes to the UK STEM agenda (Hughes et al. 2011).

The methodology chosen for the research as a whole is the constructivist version of grounded theory suggested by Charmaz (2006) and supported by commentators such as Strauss and Corbin (1998), Bryant (2002) and Corbin and Strauss (2008). Constructivist grounded theory, as opposed to the original ideas of Glaser and Strauss (1967), promotes engagement with the literature and other textual sources before and during data collection and analysis; encourages the researcher to use their own knowledge and professional understanding to inform the research process; and allows the research to develop in a fluid and flexible way. The methodology also includes concurrent data gathering and analysis to capture analytical insights into the phenomenon and promotes theoretical sampling to keep progressive data gathering and analysis closely related to the central features of the research field.

This phase of the research examines the views of design and technology teachers on the importance of textiles in the design and technology field and how these views relate to those of the industrial practitioners in the study. Two works elicit views from two data sources:

semi-structured interviews with two textile technology experts who work in the fields of high performance textiles, medical textiles, geo-textiles and apparel manufacturing,

an on-line questionnaire survey of design and technology teachers who have responsibility for the delivery and content of textile technology within schools and sixth form colleges (n=143).

Political, economic and educational context

As discussed, the research programme has taken place against a background of potential radical change to the English schools' system and the role design and technology may play within it. During our research, it has become noticeable that many design and technology teachers are beginning to discuss issues within a context of such change. It is worth pointing out at this juncture that changes may not affect the educational systems of Scotland, Wales and Northern Ireland in quite the same way due to differences in national devolved government policies.

Perhaps, the most controversial issue is the anticipated introduction of an English Baccalaureate (EBacc) system into secondary schools in England. This proposal endorsed by the current UK government consists of a curriculum made up of five core subject areas: mathematics, science, English, a humanities subject and an ancient or modern foreign language. Remarkably, considering

the impact design and technology has had on many aspects of schools' pedagogy (see amongst others Hughes et al. 2011), the baccalaureate, in its current form, does not include design and technology. A move strongly resisted by a number of individuals and interest groups, for example the Design and Technology Association (DATA) (www.data.org). In this governmental context, the English baccalaureate may be seen as made up of a set of 'traditional' subject areas which together take academic precedence over 'lesser academic' subjects such as design and technology, arts based subjects, music and information and communication technologies. This, for us as design and technology teacher trainers, is an ill-founded assumption especially when many of the perceived 'lesser academic' subjects contribute vastly to the creative and technological well-being of the nation.

This potential 'downgrading' of technology within the schools' curriculum has a parallel in its removal as a National Curriculum core subject at Key Stage 4. In the original National Curriculum for England and Wales (introduced in 1988), design and technology formed a core, key element of pupils' educational entitlement up to the age of sixteen and had equal merit with subjects such as mathematics, science, English and history. This ensured that pupils in secondary schools had a broad and balanced curriculum which provided suitable learning experiences for the world in which they would live. Removing design and technology as a core subject may also be seen to have an effect on the number of teachers training in this area. Teacher training levels for design and technology have been reduced by around 50% for 2011 (www.tda.gov.uk), and reductions may continue in following years.

Our exploration of the future needs and role of design and technology in modern society has begun with an examination of textile technologies. We view this as a useful starting point for our research because of the significance textiles has in many industrial areas: especially in North West England the area where much of the research has taken place. A number of commentators have discussed the modern nature of the industry in both domestic and global terms. These include changes in market competition (Hines and Bruce, 2007), the effects of globalisation (Tyler 2003), evolving product and process innovations (Collier, 1990) and changing workforce needs (Hughes and Hines, 1993). Central to such changes have been rapid advances in computer aided design and manufacturing technologies leading to competitive advantages in areas such as reduction of the lead time from design to market and the flexibility of manufacturing design.

Methodology, data collection methods and relationship to the programme as a whole

Constructivist grounded theory allows a fluid and flexible route through our research whilst focussing on the core aim of the study i.e. to understand the nature and essence of design and technology in post-industrial contexts. A fuller description of constructivist grounded theory and our reasons for adopting the approach are discussed in Hughes et al. (2010) and Hughes et al. (2011).

One hundred and forty three design and technology teachers responded to our on-line questionnaire. The Questions relate to (i) the geographical location of the respondent's school (ii) whether respondents were actively involved in teaching textiles in their school (iii) the year groups being taught textiles in the respondent's school (iv) whether textiles is taught as part of design and technology, or as part of art and design, or both (v) whether the school operates a carousel system at Key Stage 3 i.e. pupils experiencing a number of design and technology subject areas on a rotational basis (vi) the number of hours per week design and technology was taught in the respondent's school at Key Stage 3 (vii) the examinations offered at the respondent's school i.e. GCSE and/or AS level and/or A2 level (viii) had there been a change in the way textiles technology had been delivered in the respondent's school in the last 5 years (ix) whether the teaching of textiles at the school covered making garments in addition to surface embellishment techniques (x) any further comments.

Although a number of questions were asked in our survey, our findings will focus on respondents' textual dialogue which relate to possible changes to the nature and form of the design and technology curriculum. These responses, in the main, relate to issues surrounding the introduction of the English baccalaureate, the move towards teaching textiles through art and design courses and the perceptions teachers have of what technological principles and knowledge should underpin the subject area.

In addition to the questionnaire data, two industrial textile technology experts were interviewed to canvas opinions on what textile students/pupils should be able to do and know to have a good understanding of the technological aspects of a modern textile industry.

Key questions for this aspect of the work;

What technological/design factors do you see to be key elements of the current and future UK textiles' economic sector?

What forms of technology should underpin such a sector in the UK?

What technological/design oriented features should underpin a textiles technology school/college based curriculum that prepares pupils/students for an understanding of modern textiles design and manufacturing practices?

What do you see as the benefit of design and technology as a subject area to your industry as a whole?

The ethical practices for work have been guided by the British Educational Research Association (BERA, 2004). Ethical implications were considered at all stages of the work. Anonymity was a key feature of the work and as such names of institutions and respondents remain confidential to the researchers.

Selected findings and discursive commentary

Teacher's comments and views from the questionnaire analysis (n=143)

This discussion is supported with comments from a small number of the questionnaire respondents. It is acknowledged that these are selected findings and that dialogue used to illuminate the discussion is only part of the whole data set. However, after data analysis we feel the comments represent the views of many of the teachers in the survey; especially how aspects of textile technology related to their own school experience.

A main concern for teacher respondents was how a baccalaureate system would affect jobs and the future of design and technology in their schools. As such, many design and technology teachers were very '...concerned about the future of textiles with the introduction of the EBacc.' and had '...great concerns regarding GCSE textiles/design technology take-up due to the new system...'

Even before a baccalaureate system has been put into place, feedback from teachers has suggested that many curriculum and school managers have already made provision for introducing the system into schools. This provision includes changing the balance and breadth of the timetable to reflect the baccalaureate changes, removing design and technology from certain optional academic routes and reconsidering the balance of staff academic skills to deliver such a system effectively. As one teacher described, 'We are moving over to a Baccalaureate only route – I will have to write/investigate a new textile course as D&T in the experimental science [option group] does not suit the subject.' This was echoed by another teacher's comment that 'After building up a successful and popular Textile department I am very concerned that it is now being phased out not only in my present school but in this area.' Although, it is envisaged by the English Government that pupils will be able to achieve vocational subjects alongside the English Baccalaureate (DfE, 2011) there is no doubt that the Government intends the EBacc to become the main measure of achievement for schools in the future; for us, a very worrying situation in relation to the status of the subject in the schools' curriculum.

A significant number of respondents expressed concerns about the way textiles technology has moved from the design and technology department in their schools to the art department.

'We are about to switch over to an unendorsed art A-level in Fashion and Textiles to offer students a better chance of putting together a fashion and textiles portfolio that might actually be of use to them...the AQA technology is [not good]...the amount of pointless and irrelevant stuff students are expected to memorise is absolutely impossible and doesn't give a good grounding...I find the current A-level exam a lottery...and students who share my passion for the subject get frustrated and bored by realms of explanation when as good design should

speaking for itself. If this continues I will have to drop this A-level and my students will have no option than to do art textiles.

We also found that this sentiment had been surprisingly gender oriented terms. 'Art [based] textiles is a lovely art subject that girls who like clothes and fashion will like. It's creative and hands on - being real Art and Craft. Textiles Technology I feel should be much more business orientated. There's a real opportunity to get pupils involved in running their own business within school – excellent for CAD CAM, printing, dyeing, machine knitting and industrial embroidery. But as a subject it is so girl orientated and based around making a one-off garment at GCSE and A-level...maybe [I] should encourage the enterprise nature of textiles [in my school].' Another teacher commented that 'I am fortunate to work in a ... school for girls where the teaching of textiles is valued. However, I am concerned that in general textiles is beginning to be squeezed out of other technology subjects or just lumped with art.'

These comments resonate with the recent Ofsted (www.ofsted.gov.uk) report on design and technology teaching in which it was noted that in some schools there were insufficient opportunities for pupils to develop knowledge in areas such as advanced design and manufacturing. As the report emphasised, this was a key weakness at a time of rapid technological advance, and that dated approaches to work in resistive materials and textiles frequently reinforced stereotypical gender choices at Key Stage 4. A further key finding of the report was that pupils have minimal teaching and learning opportunities to learn about innovative technological techniques which combine a scientific understanding of design when making practical products and systems. This, for us, can only really be achieved through pupils engaging with a textiles course of study which incorporates a STEM focus.

The two textiles examination routes i.e. design and technology oriented and/or arts and design focussed have markedly different aims and outcomes. Take for example the A-level subjects offered by two of the main examination boards in the UK: AQA (www.aqa.org.uk) and OCR (www.ocr.org.uk). In both cases textile technology, in its design and technology form, forms an element of the product design course of study which includes a vast range of technologically oriented study including an appreciation of the relationship between design, materials, manufacturing and marketing; fibre types and fibre technologies; methods of fabric manufacture; design in the human context; an understanding of environmental concerns; the use of CAD/CAM; pattern drafting; and product maintenance. On the other hand, the arts and design specifications tend to focus on aspects of shape, colour, texture, pattern appreciation, harmony and an appreciation of form and function. There is minimal focus on the technical aspects of the subject which include an understanding of batik, appliqué and fabric printing.

The sheer amount of work in design and technology textile specifications has convinced a number of teachers to change to arts courses;

'I think textiles is being squashed out of the curriculum because it doesn't really fit into the STEM agenda. What is happening to the design in Design and Technology? As a country this is what we excel at. We have top design schools...which send designers all over the world and we are ignoring this talent in schools.'

Industrial experts' viewpoints

Both industrial experts had current experience of design and its relationship to manufacture in the modern textiles industry, and both were keen to emphasise the technical, STEM oriented nature of the industry. Both discussed how technological applications of the industry such as '...just in time manufacture...the link between CAD and manufacture to speed up the turnaround between design and manufacture...' and '...the use of computer aided machines to help produce consistently well made products...' has markedly changed the skills base needed by textile technologists working in their industry. In addition to having basic textiles technology knowledge such as '...the properties of fibres and how they are used, how fabrics are woven or knitted and made into garments [or other products] ... technologists need to have an understanding of some of the computer applications of the field...' The experts emphasised that pupils/students studying textiles should have a good understanding of '... some of the technical applications of the subject to understand how designs are constrained by ways products are made...' As such, STEM aspects of the subject were seen as important in preparing students for work in the modern textile environment (Hughes et al. 2010). This relates to the

comment made by Ofsted (www.ofsted.gov.uk) that too many teachers are failing to keep pace with technological developments often resulting in an out-dated curriculum in secondary schools.

Concluding remarks

A main conclusion from our study is that many of the school teachers in the survey were beginning to question the purpose, role and value of design and technology in its present context. The nature of the design and technology may be seen to be evolving as a subject to suit the needs of school budgets, new curriculum initiatives and examination results rather than preparing pupils for the actual needs of a technological society. This may be seen to be manifested in the way there is shift towards schools offering an arts based textiles curriculum in preference to a STEM based design and technology subject. As suggested, the industrial experts favoured the skills and knowledge developed through the design and technology oriented curriculum rather than art based textiles courses. It was also noticeable that during our research that many teachers still saw textiles technology as a subject suitable for girls. We were surprised that many comments reflected such gender issues and that some teachers thought that arts based textiles ‘... is a lovely art subject that girls who like clothes and fashion will like ...’ However, for us, it is essential that design and technology textiles education is underpinned with STEM based teaching and learning to prepare students/pupils for the needs of the modern textiles industry. As Ofsted (www.ofsted.gov.uk) have pointed out, other countries, such as China and France, emphasise the study of computer aided design and manufacture (CAD/CAM) and robotics in the curriculum. However, in a third of the schools Ofsted (www.ofsted.gov.uk) surveyed, too little use was made of this technology in the teaching of design and technology.

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