

Is technology and design an academic subject?

The STeP Journal
 Student Teacher Perspectives
 Copyright © 2014
 University of Cumbria
 Vol 1 (1) pages 11-23

Edward Clarke
St Mary's University College Belfast

Abstract

This study examines Technology and Design within the context of the Northern Ireland Curriculum. I consider whether or not it can be classified as an academic subject. It also refers to Design & Technology in the English National Curriculum (NC). I examine how the subject is reported to be perceived within the school environment, what academic and career avenues it is purported to open and what approach the government holds in terms of the wider contribution of the subject to industry. In conclusion I then present a number of deductions based on the research and in answer to the overall research question.

Introduction

"Technology is a familiar word.....it would appear that technology is relatively simple conceptually. On closer examination, it is clear that this is not so"

(Custer 1995, p.219)

Over the last twenty years, education systems in the United Kingdom have undergone major reform. Whilst the education systems of England and Wales, Scotland and Northern Ireland are independent of each other and significantly different, they have all had to develop new curriculum structures, introduce new subjects and radically review existing subjects. One of the common areas where this has been undertaken is in the area of Technology and Design (T&D).

Since the introduction of the Education Reform (NI) Order (1989), the government has spent in excess of £167million making provision for the introduction and implementation of T&D within the school curriculum in Northern Ireland at post primary level (ETI 2000). It may be argued though that despite the creation of a subject called T&D and the financial investment made in it, controversy persists in terms of the definition and perception of this subject (Eggleston 1993). One of the main areas of discussion regarding the role of T&D in the curriculum relates to its changing classification from a formerly experience-based or handicraft education to a new and emerging technological literacy subject (Steeg 2008). Thus given the origins of the subject, defining it can be problematic since different models and perspectives have been adopted in different countries (Compton and Jones 2004). As an emerging subject though, it may be maintained that proponents of T&D view it as a subject that is well placed to accommodate and build upon ongoing technological, legal and social developments in the various ways that products are now designed and made. It may also be reasoned that in promoting the role of T&D there is an element of pressure on proponents of the subject to justify its place in the post-industrial society school curriculum.

This study will examine the topic of T&D within the context of the Northern Ireland Curriculum (NIC). It will also make reference to Design & Technology (D&T) as regards the National Curriculum (NC) as D&T and T&D are intrinsically linked. It will assess whether or not it can be classified as an academic subject. In order to carry out this task, the paper will carry out a number of processes. It will firstly carry out a review of existing literature on the topic to study current arguments in this regard. The literature review will examine how the subject is reported to be perceived within the school environment, what academic and career avenues it is purported to open and what approach the government holds in terms of the wider contribution of the subject to industry. The study will then

Clarke, E. (2014) 'Is technology and design an academic subject?', *The STeP Journal*, 1(1), pp. 11-23.

describe the research methodology to be employed to carry out an original piece of research. The main method to be used is that of a semi structured interview with six teachers involved in the teaching of T&D. This has been chosen as it is a proven qualitative method and was considered to be the most appropriate method in this context since the objective of study is to obtain opinions of the subject on T&D from each teacher's standpoint. The results of this process will be analysed and discussed. In conclusion the author will then present a number of deductions based on the research and in answer to the overall research question.

Literature review

This section presents a review of existing literature regarding T&D in the NIC as well as that regarded as relevant with regards to D&T in the NC. It examines the classification of the subject, how established authors on the subject of T&D perceive it and whether there is a clear path of development from studying it at secondary to university and a professional career.

Defining Academic Study

One of the aims of this study is to examine the classification of T&D within the NIC and assess if it can be classified as an academic subject. In order to do this, it is perhaps appropriate to define what an academic subject is. It has been argued that while there are no formal criteria to identify the point at which an educational programme or scholarly journal forms an academic discipline, a number of informal criteria may be presented (National Association for Sport and Physical Education 2010).

- i. **Required Subject:** That the school is required to teach the subject and students are required to take courses in the subject.
- ii. **Standards: The subject should contain academic content standards** that include expectations for what students should know and be able to do by the end of each grade or grade groupings.
- iii. **Course of study:** A course of study, curriculum framework, instructional guide, or curriculum should be in place.
- iv. **Textbooks/instructional resources:** Specific textbooks or instructional resources in the content area should be approved and available to students.
- v. **Student assessment:** Rigorous systems should exist that enable teachers to assess student performance in mastering the material taught in the subject courses.
- vi. **Grades:** Students should receive grades that document the extent to which they have mastered the material taught in subject courses.
- vii. **Teacher preparation programme accreditation:** There should be a review system in place for educational institutions regarding how institutions of higher education prepare future teachers of the subject.
- viii. **Teacher certification:** Teachers of the subject should be required to meet specific certification and education requirements.

(NASPE 2010)

This study will examine the extent to which T&D can be called an academic subject. It will do this by examining the topic both within the context of the above educational criteria and in terms of its potential contribution to a pupil wishing to pursue a career in a technological based industry.

Defining T&D

It can be maintained that defining the subject of T&D is a difficult task, given the disparity of opinion that exists as to what the subject constitutes. Variations in definition can differ internationally in terms of curricular frameworks, with even the title of the subject not an area of agreement (Ginestié 2005). In England, the subject is referred to as 'design and technology' whereas in Northern

Ireland, it is 'technology and design'. Other countries also define the subject as 'technology' or 'technological education' (Rasinen 2003). UNESCO defines the subject of T&D as, *The study of the utilization of tools, resources and systems to solve problems and to enhance control over the natural and the man made environment in an endeavour to improve the human condition.* (p121 Martin 2003)

T&D was introduced at Key Stage 3 for all pupils in Northern Ireland, as a result of the Education Reform (NI) Order 1989. The subject is modelled on the interaction between thought and action, the development of physical and intellectual skills, and the utilization of physical and intellectual resources. The specific aims of T&D as espoused by the Department of Education are to:

- develop, through active learning, pupils' understanding of T&D and to involve them in purposeful design activities resulting in the development of products;
- Promote the ability in pupils to communicate information and ideas through a variety of media. (DENI 2001)

Evolution of T&D

In seeking to clarify the classification of T&D in its current form, it is perhaps appropriate to examine the origins and development of the subject, given that the extent of how the subject has changed is a significant contributor to discussions of its status as an academic subject. The origins of T&D are very much in vocational type courses, where the emphasis was on achieving competence in order to do a job or make a living. Some authors have argued that such an emphasis has meant that the subject as it is now has somewhat 'of an image' problem in trying to present itself as a modern component of the NC. Levin and Kojukhov (2008) argue that as micro-technologies form the basis of post-industrial society, the type of T&D previously taught is virtually redundant in the light of new technological developments. Interestingly some authors with regards to D&T in the NC argue that the subject as taught today is still irrelevant as the skills it teaches are outdated. Steeg (2008) argues that the current D&T curriculum in England for example, is irrelevant because the skills it develops in pupils are derived from industrial design practice. According to him, ideas of designing for clients, designing for mass production, market awareness and protecting design ideas are irrelevant in this age. Entrepreneur James Dyson, a supporter of D&T in the curriculum points to the issue of the image problem that D&T is purported to have.

That's probably because it has its origins in the school wood workshop in the days when everyone had to make wooden matchbox holders (in Smithers 2011, p.1)

It can be argued though that the subject has been transformed from one dealing with traditional technology education (experience based or handicraft technology) to a more modern one. Supporters of the subject maintain that it has evolved into a subject which has, at its centre, a distinctive model of teaching and learning, one which is project-based and involves learners taking a task from inception to completion within constraints of time, cost and resources (Kimbell and Perry 2001). Others have contended that D&T deals with the development of appropriate solutions to human problems, with value judgements being made throughout the designing and making process (Owen-Jackson, 2002).

Perceptions of T&D in the Classroom

An important part of this study is to examine how T&D is perceived by those whose role it is to teach the subject, namely secondary T&D teachers, both in terms of satisfaction with the subject content and from the perspective of career progression. Research indicates that the subject does appear to still have an image problem among students in terms of the efficacy of the subject (Neale 2003). Neale's study in Scotland found that 70% of similar aged pupils (Key Stage three and four) stated that they did not want to continue any studies in technology. Interestingly, in the same study, nearly

30% of pupils said that if, in retrospect, they had been given the option, they would not have taken T&D at key stage four (Neale 2003). Mottier (1999) also observed that the more technology is introduced in general education, the more students turn to other studies. It may thus be argued that while the subject has evolved, T&D remains slightly under valued as a subject and that many pupils find the subject unsatisfying (Keirl 2007, Steeg 2008). Authors that have investigated D&T in England such as Keirl (2007) argue that since D&T was introduced as a subject, it is still looked on as a marginal subject within the context of the NC. Keirl argues that the government in England's perceived focus is on too narrow a range of core subjects such as mathematics, science and English, meaning that there remains a fear that D&T may be one of the more marginal subjects removed from the list of those that, as part of the NC, have to be studied by secondary school pupils. He advocates that this would have underlying consequences for T&D in the NIC.

For many years the technology and design community has carried more of a curriculum development burden than most subjects – especially those born with their silver spoons (English, maths, science) that have historical precedent, unchallenged status, and assured resources on their side (Keirl, 2007, p. 70)

Despite the above fears, regarding the future of the subject, proponents of T&D state that the subject can still make a number of contributions to the curriculum as a whole including the development of technological literacy,, the promotion of logical and systematic thinking and an improved understanding of technological devices and their deployment (King 2013).

Contribution of T&D to Industry

A number of proponents of T&D have argued that the future will be very bleak for the manufacturing industry if T&D with its now more up-to-date focus on high technology were downgraded. In 2011, OFSTED hailed the high standards of teaching and learning in the D&T arena in Britain, highlighting the significant take-up rate of the subject. Indeed a breakdown of GCSE exams taken in 2010 showed that, after Mathematics, English and Science, T&D was the most popular subject studied (Smithers 2011). Entrepreneur James Dyson highlighted what he viewed as the importance of the subject both to the NC and wider industry saying,

it absolutely deserves to remain as a compulsory subject on the secondary school curriculum.....Without it, it will be even harder to inspire young people to go into the engineering professions and develop new technology. Modern technology and design should sit alongside science and maths. It should have the academic rigour of engineering, attracting the brightest minds; it should be logical, creative, and practical – inspiring young problem-solvers (Dyson 2011, in Smithers 2011)

Research methodology

The aim of this section is to outline the research process carried out to examine the issue of T&D in the NIC. The process was carried out by conducting a series of semi structured interviews with teachers with experience of T&D teaching. A total of six interviews were undertaken. This process arguably acted as an 'on the ground' perspective of the issue which contributed significantly to the review of existing literature on the topic.

Method

The study was a qualitative study in which a total of six T&D teachers were interviewed to gain an insight into their views of T&D within the NIC. A semi structured interview was used both to get answers to specified questions and to also facilitate an exploration of relevant issues that may be raised by the interviewees.

Participants

Participants for the study were recruited through convenience sampling from a pool of teachers in two different secondary schools in Belfast. Partakers were considered to be appropriate contributors to the study as they had prior experience of T&D from a teaching perspective. The sample was comprised of 6 (100%) males and 0 (0%) females with a mean age of 57 years. Inclusion criteria for this study were that participants had to have a minimum of ten years' experience teaching T&D in a secondary school environment. The exclusion criterion was the refusal to give informed consent or a lack of experience or knowledge of the subject. Participation in this study was purely voluntary and no incentives were offered.

Interview Protocol

The interview protocol employed in the series of semi structured interviews was developed following a comprehensive search of existing literature on the topic of T&D, both within the NIC and in the context of its contribution to industry. Many of the questions posed were of an exploratory nature, aimed at examining the type of issues that participants would raise when discussing the topic (e.g. what is 'T&D, what place does it have in the NIC?). From a balance perspective, questions were phrased in both a positive and negative direction. The inclusion of such open-ended questions, which required more than just a simple yes/no answer, allowed those being interviewed to have some latitude in their responses, as well as providing a means to expand on their answers enabling them to introduce related topics they considered appropriate to the questions being asked. Other questions posed were more specific, seeking information on topics of interest to the study (e.g. Do you see T&D as a pathway to a professional career?). The interview questions asked can be found in Appendix One.

Procedure

The semi structured interviews took place in two different High Schools, which will be called school (A) and school (B). The locations were considered appropriate as participants were familiar with the surroundings and would not be perplexed by the environment. It also meant that participants did not incur any undue travel expenses in attending the interviews as they were attending for their normal work day. The neutrality of the settings therefore gave rise to frank and open discussion and allowed for the expression of personal viewpoints. All six interviews were carried out over a three week period between April and June 2013.

For the duration of each interview, the interviewee and interviewer were seated around a table in a private room, to maximise visual contact and non-verbal communication. The researcher ensured that the rooms were comfortably warm, well ventilated and that there was no external noise that might hamper the discussion. Prior to the commencement of each interview, there was a brief introductory session, during which the purpose of the interview was outlined. Each interviewee was encouraged to ask questions about anything they did not understand about the interview process before deciding whether or not to participate in the discussion. Participants were informed that the interview would take no more than thirty minutes and that any information gathered would be completely anonymous and treated with the utmost confidentiality. They were further advised that their participation was entirely voluntary and that they had the right to withdraw from the interview at any time. Audio –visual equipment was placed in an unobtrusive position, so as not to inhibit the interviewee's engagement in the discussions. A non-prescriptive, semi-structured interview format was employed by the researcher. In total, two hours of interview data was collected, transcribed verbatim and thematically analysed. At the end of each interview, the interviewee was fully debriefed and thanked for their contribution to the study.

Data Analysis

All interview recordings were transcribed verbatim. Any piece of information that could potentially identify a participant was removed or modified to ensure participant anonymity. To capture a participant's precise flow of speech, full stops were employed to signify the end of a spoken sentence, commas to signify short pauses and ellipsis points to signify an abrupt end, or a reorientation of thought.

Thematic Analysis

Thematic analysis was utilised as the qualitative analysis method in this study. Thematic analysis entails the systematic and thorough examination of data in order to identify themes that are then progressively synthesised until higher-order units (superordinate themes) are determined that capture the essence of the topic of interest (Willig 2001). This method of analysis involves six phases of analysis, namely: familiarisation with the data, generation of initial codes, a search for themes, a review of themes, defining and naming themes and writing up of the report. The results of this thematic analysis are presented in the next section.

Presentation and analysis of data

Following the completion of thematic analysis on the interview data received, four superordinate themes were identified from the interviewee's perceptions of the topic of T&D and their experience of teaching the subject. The first theme related to 'the utility of T&D as a subject', which included the sub-themes of 'subject content' and 'academic or vocational subject'. The second theme that emerged was 'public perceptions of T&D' which included 'legacy issues' and 'organisational culture'. The third and final theme identified was 'T&D: Contribution to Industry' which includes the sub-themes of 'promotion of innovation and creativity', 'increasing relevance of T&D related skills' and 'career pathway options'.

Theme One: Utility of T&D*Subject Content*

Participants were asked how they thought the subject of T&D contributed to education. Most of the responses received were positive, highlighting aspects of the T&D syllabus which they considered relevant in the current marketplace such as design and ICT, with one participant commenting, *"there are many different strands to it from electrical to manufacturing to CAD to computers to modern day industry"*. Some participants pointed to the added gravitas that the subject has as a result of its compulsory status to key stage three. Indeed, it was also highlighted that recent changes in the NIC were easily adapted to by T&D, given the characteristics of the subject. One participant commented on this saying,

"A lot of the new curriculum stuff that came out slotted straight into T&D such as peer and self assessment as we have always done that. That goes for problem solving as well as ICT skills and when they rolled out the new curriculum we slotted straight into it because we were already doing it"

Interviewees highlighted the range of skills that T&D students can develop as part of their participation in the subject and the enjoyment that pupils can get from it. Interestingly, one participant described this enjoyment as being *"a bit of a release valve for some pupils from the pure academic subjects"*. In relation to subject content, a number of responses highlighted that while the range of subject topics in the T&D syllabus are of high value, the extent of those listed means that teachers are often not able to go into specific topics in any great detail. One interviewee outlined this problem saying,

"I think the main disadvantage of T&D is that it has a huge number of elements to it, and the student will only scratch the surface of each element and doesn't really know the material in detail.....it is an enjoyable element to teach but the content is too big"

Academic or Vocational Subject

The question of whether participants deemed T&D to be an academic subject is one central to this study and one which produced a number of interesting responses. A number of interviewees highlighted the development of the topic from a more vocational subject to one which is academic in nature and assessment. The general consensus was that the subject can now be classified as academic in nature due to developments in the curriculum, the assessment of the subject and its classification as a compulsory subject up to key stage three. Participants commented on these developments as follows,

"I would view it as an academic subject because of the level of examination in it"

"I view it totally as an academic subject because at A Level, there are a lot of science calculations, there is English, Mathematics and ICT. I think it's a great subject and I think a lot of universities value T&D."

"It has got more academic lately because we are trying to open more career paths into it with degree courses"

Interestingly though, while most participants acknowledged that the subject can be viewed as academic in content, they did point to the fact that the subject can be an important tool for pupils following a more vocational career pathway and as a result, stated that it would always maintain a vocational emphasis in its classification as well. One participant explained this approach, saying,

"I view it as both academic and vocational really. Students can use it as a base for going to university depending on what career they have chosen. Vocationally, it leads into for example, BTEC which they can pick for A Level and they are probably slightly more vocationally orientated"

"I think it is very important from the point of view of developing a young person. It helps them develop their creativity and sometimes they end up producing and designing things that they otherwise maybe thought that they didn't have the skill to produce."

Some participants raised the point that while T&D may now be viewed in the same way as other academic subjects such as science or maths, it does not necessarily need to be considered as such. Rather, it was debated that in itself T&D will not lead to third level academic qualifications but that it is now considered as a valuable component of an individual's qualifications repertoire or skill set in conjunction with the more established subjects.

"T&D on its own doesn't lead to architecture or it doesn't lead to civil engineering, you need a combination of subjects and usually science is in there"

Theme Two: Public Perceptions of T&D

Legacy Issues

All six participants were very definite in highlighting the perception problem relating to T&D which they deemed as a central reason why some colleges or employers may not place as much emphasis on T&D in the same way they do the more traditional subjects such as mathematics or science. One participant summarised this perception problem succinctly saying,

"I think T&D has an image problem because I think people still think that T&D is woodwork.....There are teachers out there that call us the hammer and nails department and unfortunately that's the image that we have to live with"

Participants pointed to the fact that while the beginnings of T&D revolved around practical subjects such as woodwork, the subject has evolved to include much more modern and academic based issues which are not being acknowledged. In addition, one participant stated that in their experience T&D was seen as a career path only for those pupils who were not capable of studying the more academic subjects.

"I have seen where I was left with the students that were less able, it was 'you're fit for nothing else only T&D', the practical subjects, the trades"

Some participants while acknowledging the image problem did state that they thought the situation was improving gradually.

"Up until recent years, it was maybe a little bit down the pecking order but I think in today's terms they are giving it a lot more recognition"

Organisational Culture

A number of the participants raised the point that the perception of T&D within a school community could be very much dependent on the emphasis placed on it by the school principal and relevant department heads. They stated that where the subject was given appropriate resources and promoted among the school population, it could be a great success. Likewise, some participants highlighted their experiences of schools where T&D was deemed as a veritable 'last stop' for pupils of lesser ability, other than an avenue for learning for all pupils.

"A lot of that is down to how the principal views it. If he has a good team of T&D teachers, then he will use them. Unfortunately, I think a lot of schools channel in lower ability pupils into some of the T&D classes hoping that they would be catered for their"

"I have seen varying degrees of importance especially in Grammar schools, they don't put the same emphasis bar the few.....In the secondary sector, T&D is pushed but again, it's still not viewed as heavily as the maths or science"

Participants also highlighted the fact that in most schools in which they had taught, T&D did not in any way have the same prestige as more established subjects such as maths and science.

"I think the schools are still pretty much wrapped up in Science, English and Maths, and yes we have the STEM subjects and so on but I sometimes feel that it's still not given the full recognition within schools"

"Parents understand what T&D is about but I think that they put more emphasis on science and maths. It would not be a core subject like that"

Partakers stated that for the subject to be given due consideration in schools, it was important for teachers to keep the subject fresh for both pupils and teachers. One participant commented,

"If you're turning out the same coursework year on year, same products, not only will the pupils get bored, other staff members in the school will just say it's the same stuff again.....it's up to the department and the head of department to keep things evolving"

Theme Three: T&D - Contribution

Contribution T&D makes to fulfil a pupil's ambition of having a career in the technology industry.

Promotion of Innovation and Creativity

Participants were keen to point to the potential contribution of T&D to industry, reporting its increasing emphasis on creativity and innovation. A number of participants cited their experience of T&D being a useful tool for pupils leaving school, both in terms of the accreditation and the skills developed through learning the subject.

"I always found it very valuable to pupils leaving school. Not only from a career aspect but also problem solving, no matter what direction they go"

"I do think that if a particular student coming into a company has maths or science with T&D, they would view that person as having an all-round education because they are touching on all those different areas which is key to industry today"

In arguing for the benefits to be accrued by T&D, a number of participants pointed to a potential problem in getting employers to recognise the benefits of the subject. They stated that as the evolution of the subject is a relatively recent phenomenon, many industry leaders may not have had the option to study T&D and may therefore not be aware of the benefits of having a qualification in T&D.

"Maybe because a lot of people who are high up in running these companies didn't come through the T&D route.....they might look at their valued employees and find they came through the T&D route, those that have a good head for problem solving and things like that"

Increasing Relevance of T&D related skills

Participants emphasised the opportunity for pupils to develop skills through the subject of T&D. They cited that one of the aims of the subject is to encourage creativity and innovation among young people and that this is an aspect that T&D focuses on. Some participants argued that this is very much needed and cited examples of a lack of creativity among some school populations.

"Design is a massive part of the business world.....everyone is looking for new products in industry and they are always looking for people to come up through the education system to fill those positions"

"that's something that I think pupils find challenging which is being creative and being innovative.....if I sit a piece of paper down in front of some boys and ask them to design a table, some of them can simply not do it or wouldn't even know where to start.....they like to be spoon fed but there are boys out there of a higher quality who can be very creative"

Some participants argued that the promotion of creativity within the T&D syllabus was sometimes curtailed by the teaching aids available to them. One participant stated,

"What they do in T&D is very limited because there are an awful lot of constraints. There are only so many materials that they can use; only so many design techniques they have at their disposal. So it's not really helping them to innovate or design, they are usually only modifying what is already there"

Career Pathway Options

Participants were asked for their opinions as to what contribution they considered T&D can make to the career path of students. The responses in this regard were mixed. Interviewees agreed that the development of the subject in recent years has meant that it is now undertaken by more pupils with a view to a university education than would have previously been the case.

“Of course it is (an accessing career), you have got the STEM area, you’ve got the different product designs, the engineering routes and now this new environmental technology route which is really the up and coming thing within the country.....the jobs that are going to be created through it are going to be massive”

“I have found that a lot of my students that come through T&D go on to play important roles within key industries and manufacturing companies. One pupil.....is in top innovation creating new seats for planes...., another is in top end manufacturing. Some of the work they are doing there involves making planes lighter and better fuel economy, that’s innovation and industry at the top end”

Despite the above views, participants still stated that T&D has some way to go before being considered as an equal with the more established subjects such as science in terms of acceptance for university courses. However, they did argue that the changing emphases in industry lend themselves to the increasing adoption of T&D as a well considered academic subject.

“if this new environmental technology comes in, it will create a face and a new image for T&D as a whole because it’s all to do with renewable energies, recycling, reusing and reducing our carbon footprint.....Every manufacturing company in industry today is trying to take these concepts on board such as reducing electricity bills and renewable energies and stuff like that. if we can get students keyed into that then it’s going to get them out into manufacturing and this is definitely going to change the whole face of T&D as a subject”

“They are pushing T&D now because they are not getting the calibre of trainees that are required. This is where data handling, problem solving and ICT skills come into play”

“I found that the more academic students lost out.....when you bring in all the skills that the students are supposed to have such as problem solving, managing information”

Discussion and conclusion

This paper has sought to examine whether T&D is an academic subject. It has sought to examine this question through an examination of existing literature on the subject and through a series of six semi-structured interviews with teachers involved in the T&D area. Having carried out and subsequently analysed the responses received, the researcher is able to make a number of conclusions within the context of the themes identified.

The first theme identified was the ‘utility of T&D’, examining the subject content and its classification as an academic or vocational subject. This paper has charted the development of T&D from its early inception to its current format following NC reform. It is reasonable to state that in its original form, T&D was very much a vocational subject, targeted towards students who had chosen to undertake a career path that was not academic in nature. In its current form however, this paper has shown that T&D is comprised of more academic based modules, assessed in an academic manner, with accreditation in the subject increasingly used by pupils as part of their applications to

study a variety of courses at third level colleges. However, while the subject has undergone significant change in terms of content, research carried out in this study confirmed that in terms of academic gravitas, T&D is in no way yet equated with the more traditional subjects of mathematics and science. It may be argued that this is an entirely expected outcome since the subject will take some time to become established and shed its traditional image of a vocational subject. Proponents of T&D may also have to be realistic that while it may evolve into a sought after qualification for entry into university, in the short to medium term this may be in conjunction with other more established subjects rather than in isolation.

In relation to the content of T&D it has been argued that the rate at which technological developments impact on the teaching and learning of T&D is more regular and rapid than in other subjects. As a result, it may be argued that in order for T&D to have continuing relevance, the subject content needs to keep evolving to reflect technological developments in the wider environment.

The second theme identified in the research related to the perceptions of T&D. In this respect, this paper concludes that this characteristic of the subject is likely to be the biggest barrier to the improving perception of T&D as an academic subject. The traditional view of T&D as a 'hammer and nails' subject has been cited by entrepreneurs such as James Dyson as one of the challenges to the subject in becoming a sought after qualification to attain. There are certainly legacy issues in relation to how the subject has been viewed prior to the national curriculum overhaul and it is likely that these legacy based views will impact on both student and institution perceptions of the topic for the foreseeable future. However, as the subject continues to be studied and becomes a mainstay on university applications, it may be argued that this legacy aspect is likely to fade. The third theme identified in the research was that of the contribution that T&D has to make to society and industry. In this respect, this paper concludes that the potential contribution of T&D qualifications particularly to industry will spur its continued development as an academic subject. One of the cited advantages of T&D is that it is purported to facilitate the development of a transferrable skill set not necessarily found in the more traditional subjects such as mathematics or science. Much of the literature cited in this paper discusses the importance of the skills of creativity and innovation in an ever changing industrial context and the emphasis that potential employers place on applicants being able to think for themselves and show good problem solving abilities. In this respect, it may be the case that the demand for T&D trained students will come from industry rather than the educational establishments, as people currently qualified in the subject move up the career ladder taking with them an awareness of the benefit of the skills accumulated through it. This will arguably be an important factor in the subject being taken more seriously. Indeed, this current problem was exemplified by one of the interviewees reporting that very few chief operating officers would have gone to university as a result of T&D qualifications. As this situation changes, the perception of the subject within industry may take on a higher stature.

In conclusion, this paper has sought to answer the question of whether T&D is an academic subject. In terms of subject content, it certainly meets the various markers in terms of accreditation and examination. However, the classification of the subject as an academic one is a separate issue to that of acceptance which is arguably the main challenge with regard to T&D. It remains to be seen if the subject grows to become a sought after academic subject, bereft of any legacy issues.

References

- Compton, V. and Jones, A. (2004) 'The nature of Technology: A Briefing Paper prepared for the New Zealand Ministry of Education Curriculum Project' Available at www.tki.org.nz/curriculum/whats_happening/index_e.php. Accessed on 19th October 2013.
- Custer, R. (1995) 'Examining the dimensions of technology' *International Journal of Technology and Design Education*, Vol. 5: 219-244.

- DENI (2001) 'Education for the 21st century: Report by the post primary review body' Department of Education Northern Ireland. Available at http://www.deni.gov.uk/22-ppa-burns_policy_context.pdf. Accessed on 21st November 2013.
- ETI (2000) 'The Education Reform Programme: Survey of science and technology and design' The Education and Training Inspectorate, Department of Education, Co. Down. Available at <http://www.etini.gov.uk/education-reform-programme-survey-of-science-and-technology-and-design.pdf>. Accessed on 11th November 2013.
- Ginestié, J. (2005) 'Résolutions de problèmes en éducation technologique. Education technologique' 28, 23-34.
- Keirl, S. (2007) 'The Politics of Technology Curriculum', in Barlex, D (Ed) 'Design and Technology for The Next Generation', pp.60-73, Cliffeco Communications: Shropshire.
- Kimbell, R, Perry, D (2001) 'Design and Technology in a Knowledge Economy'. London: Engineering Council.
- King, C (2013) 'The lexicon of technological literacy: A Northern Ireland perspective' Available at <http://webapp1.dlib.indiana.edu/cgi-bin/virtcdlib/index.cgi/4273355/FID1/journals/ENC2333/2333.htm> . Accessed on 7th June 2013.
- Levin I., Kojukhov A. (2008) 'Virtualization and Educational Technology in Post-industrial Society' Int. Design & Technology Education Conf., PATT-20, 3-6 Nov. 2008, Tel-Aviv, Israel.
- Martin, M. (2003) 'Significance of sustainability issues for design and technology education: Rhetoric, reality and resources' In Dakers, J. and de Vries, M.J. (2003) 'PATT-13 International conference on design and technology educational research' (pp.165-169) Glasgow, UK. Faculty of Education, University of Glasgow.
- Mottier, I. (1999) 'Impacts of Technology Education: Introduction to the Conference', in Mottier, I., and de Vries, M.J. (eds) 'Pupils Attitudes Towards Technology Annual Conference'.
- NASPE (2010) 'Physical Education is an academic subject' National Association for Sport and Physical Education. Reston, VA. USA. Available at <http://www.aahperd.org/naspe/advocacy/governmentrelations/upload/pe-is-an-academic-subject-2010.pdf> Accessed on 14th November 2013
- Neale, J.G. (2003) 'A longitudinal study of pupils' attitudes to Design and Technology at key stage three and four in the National Curriculum', in Daker, J.R. and de Vries, M.J (eds). 'Pupils Attitudes Towards Technology Annual Conference'. Glasgow: University of Glasgow
- Owen-Jackson, G (2001) 'Learning to tech design and technology in the secondary school' London, UK. Routledge.
- Smithers, R (2011) 'Will technology and design survive the curriculum review?' The Guardian, Tuesday 5th April 2011. Available at <http://www.guardian.co.uk/education/2011/apr/05/james-dyson-design-technology>. Accessed on 6th June 2013
- Steeg, T (2008) 'Makers, Hackers and Fabbers: What is the future for D&T'. The Design and Technology Association Education & International Research Conference, Leicestershire.
- Willig, C. (2001) 'Introducing Qualitative Research in Psychology: Adventures in theory and method'. Buckingham: Open University Press.

Appendix 1: interview protocol

1. What are your overall impressions of Design and Technology as a subject?
2. Do you see D&T as an important part of the National Curriculum?
3. Do you view D&T as an academic or vocational subject? Is it a pathway to university?
4. Do you view D&T as a means to accessing a professional career?
5. Do you think D&T has a role to play in fostering innovation and creativity in business?
6. Do you think companies view a D&T qualification as highly as, say mathematics or science?
7. Do you think schools place a strong emphasis on D&T?
8. Do you think D&T has an image problem? Do people take it seriously?