ST MARY'S UNIVERSITY COLLEGE BELFAST

Capstone Project

Portfolio Problems: Creativity within the Design Folder

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1.0 Introduction

It is widely accepted that many, if not all, engineers and designers will maintain a record of their work as it develops. This record, or folder, can help the engineer or designer to develop their ideas, and will help them to remember lines of thought or processes that they have already taken. This principle is applied to Technology and Design (T&D) in the form of a portfolio or folder. Like industry, pupils are required to note ideas and thoughts, sketch designs and document manufacturing processes. However, the design folder has become regimented and controlled, with many aspects lacking original or creative thought. This project is based on a research study into whether the design folder in T&D is a creative document that promotes and enhances creativity. The aim of this study is to ascertain whether the T&D folder fully promotes pupil creativity, what strategies are used by teachers to achieve this, and whether this portfolio is suitable for all attainment levels in T&D.

During School Experience, I have consistently observed pupils struggle with creative aspects of T&D, in particular the design folder. The design folder is an opportunity for pupils to investigate, sketch, develop and model various designs *(Burke and Rainbow 2008)*. However, in my experience I have found that many pupils struggle to think of original, interesting ideas, and this is witnessed in poor design folder work.

The Education and Training Inspectorate of Northern Ireland (ETINI) also recognise creativity in schools as a problem area. The ETINI produced a report (2001) on how to improve the subject of T&D in Post Primary Schools. This report highlights specific areas of improvement, encompassing creativity and/or design.

> There is a need to enhance significantly at KS3, the passion, for the development in the pupils design ideas" and "In the majority of KS3 pupils, problem solving through design activities has been significantly underdeveloped *(Improving Technology and Design in Post Primary Schools, 2001, p. 3)*

A report by OFSTED in 2011 mirrored the results of ETINI.

> The basics of good design and technology teaching involve stimulating children's creativity and curiosity, and teaching them the skills needed to turn that creativity into a functional product.
>
> *(http://www.ofsted.gov.uk/news/design-and-technology-curriculum-needs-modernising-ofsted)*

Both the OFSTED and ETINI reports concluded that there is a need for greater understanding and development of strategies regarding design and creativity. Both documents point to restrictive teaching methods used in a minority (10-29%) *(Improving Technology and Design in Post Primary Schools, 2001, p. 3)* of schools which have an effect on pupil motivation, stimulation and imagination. *(Improving Technology and Design in Post Primary Schools, 2001, p. 3)*

The lack of creativity and design is also highlighted by current literature. A significant number of academics have highlighted the need for change and suggest teaching strategies and curriculum changes that could be implemented to improve pupil creativity. This research study will highlight specific teaching techniques that literature suggests can be used to enhance creativity within the design folder. In addition, the viewpoints and opinions of T&D teachers will be presented and analysed.

The area of creativity and design is one that will form the basis of many lessons for me as a T&D teacher. I feel that by carrying out this research study, I will be able to develop my understanding of this area and utilise specific teaching techniques to improve pupil creativity.

2.0 Literature Review

Creativity is defined as the ability to generate original ideas that may be useful or worthwhile *(Sternberg and Lubart 1999)*. Creativity forms a significant part of the education process, highlighted by politicians, policy makers, educators and researchers as being important at individual, societal and economic levels.

Creativity has a central role within T&D. The Northern Ireland Curriculum (NIC) for T&D states that in order to empower young people, teachers must promote creativity in a

number of ways. These include expressing meaningful viewpoints, participating in stimulating group discussions and encouraging learners to be curious and experiment with aspects of technology. *(Northern Ireland Curriculum, Guidance for Technology and Design at Key Stage 3, 2007, p.4).*

Although curriculums are now making creativity mandatory, *(Northern Ireland Curriculum, Guidance for Technology and Design at Key Stage 3, 2007, p.2)* this does not necessarily foster creativity in the classroom *(McLellan & Nicholl 2008)*. This is evident in the Education and Training Inspectorate Northern Ireland (2001) report on improving T&D Design in Post Primary Schools. The report published findings based on inspections carried out over a four year period (1997-2001). It highlighted the need for a minority of T&D teachers to improve their teaching strategies in order to develop pupil problem solving and creative skills *(Improving Technology and Design in Post Primary Schools, 2001, p. 3)*. McLellan and Nicholl (2009) also draw attention to evidence suggesting creativity in T&D classrooms is deteriorating, with popular culture accounting for many design images and ideas. In addition, a report carried out by OFSTED (2011), highlighted that the design and technology curriculum needs modernising.

It is obvious that creativity is something that cannot be incorporated into everyday learning as easily as the times tables. There is a perception that creativity is an attribute that you either possess or do not. It is widely believed that human beings are inherently creative, yet society and the education system have each played their part in diminishing creativity *(Robinson 2007)*. It is estimated that by the time the average person finishes college, he or she will have taken over 2600 tests, quizzes and examinations *(Van Oech 1998)*. Van Oech argues that these assessment forms predominately look for a single right answer, and that creative design has many right answers, all depending on what you are looking for.

In order for creativity to flourish, there are a number of conditions that must be met. Undoubtedly, the role of the teacher is central to fostering pupil creativity. Csikszentmihalyi (1999) states that teachers form part of the 'field' that mediates 'individual students' access to a domain. Nicholl (2004) also talks about the importance of a creative domain. "Teachers literally hold the creative key, to the creative door, through which pupils access the creative aspects of the domain." *(Nicholl, 2004, p.2)*. However, all teachers will have

their own perception of creativity, which will ultimately influence how they teach, and how their pupils express creativity.

Jeffrey and Craft (2004) suggests that teachers must make the distinction between teaching creatively and teaching for creativity. "Young people's creative abilities are most likely to be developed in an atmosphere which the teachers' creative abilities are properly engaged" *(Jeffrey & Craft, 2004, p.2)* Lucas (2001) as cited in Jeffrey and Craft (2004) recommends four key conditions for creative learning in schools.

1. *The need to be challenged.* Setting goals for ourselves, not being afraid to fail and learning from failure.
2. *The elimination of negative stress.* If our brains are over stressed we will not work to our full capacity.
3. *Feedback.* With high quality feedback, students will acquire self-knowledge, deepen self-esteem and continue to be motivated to learn.
4. *The capacity to live with uncertainty.* Teachers can help to seek creativity; however, it is unrealistic to expect them to have all the answers. Nevertheless, they can provide suitable alternative structures and processes.

(Jeffrey & Craft, 2004, p.2)

Morgan et al (2013) have suggested modern methods for generating creative ideas. The use of bio mimicry, where ideas are inspired or imitated by any aspect of nature, is widely used by engineers to develop new products or materials. Morgan et al suggest that by looking closely at the natural world, pupils, like engineers, can be inspired to generate new ideas based on the principles of nature.

However, teaching creatively is not always simply improved by adhering to set strategies or curriculum requirements. The context of each school, perceptions of the subject and the teacher's approach must all be considered. Research from McLellan and Nicholl (2008) found that many pupils' T&D work lacks challenge and freedom, and that the T&D classroom, is not always conducive to creativity. McLellan and Nichol go on to state that 'nearly every' teacher they interviewed (Mc Lellan, Nicholl 2008) recognised that much pupil

work was uncreative and that the education system or school context prevented creativity from thriving.

Millar and McGimpsey (2011) stated that T&D in schools is often taught by teachers with little or no design education at third level. Therefore, it is unsurprising that staff will rely on curriculum requirements, as they do not have any existing knowledge to draw from. Davies (1996) shares the same concerns- "pupils' failure to make progress (with creativity) is partly caused by teachers' lack of subject knowledge and practical expertise necessary to give pupils a broad experience" *(Davies, 1996, p.1)*

In order for creativity to prosper fully, it is essential that the pupil is willing to participate and engage in the learning process. Many pupils feel that they are not creative, and struggle to think of, and develop designs. However, Davies (1996) notes that pupils are asked to solve problems in T&D without fully understanding what the problem is, and whether it is of any interest to them. Therefore, it is imperative that teachers contextualise each design problem, linking it to the real world, and their pupils. Bloom et al (1956), as cited by Nichol (2004), argue that creativity is a cognitive process of the highest order. Therefore, there is a need for creativity to be developed and nurtured from an early age.

Kimbell (2000) expresses concern about the method of delivery in T&D classrooms. He feels the step by step approach to design, in relation to design folders, is outdated and that a more holistic nature exploring a wider range of techniques would be more beneficial.

Portfolios, or design folders, are an integral part of T&D from Year 8 though to Year 14. The portfolio provides an opportunity for pupils to investigate, sketch, develop and model various designs (Burke and Rainbow 1998). It could be argued that the portfolio is often the most creative aspect of T&D. Many academics have suggested the positive role of portfolios. Klenowski (2002) states that portfolios can help to clarify student thinking, contextualise study and identify a focus. However, Welch & Barlex (2005) are more critical of the portfolio in D&T arguing that many aspects of T&D folders have become superficial, with students spending vast amounts of time on presentation, at the expense of designing. Klenowski (2002) notes that portfolios should support learning, offering the students opportunity to choose what aspects are included. In doing so, the pupil will be empowered and more likely to 'demonstrate growth' and self-reflect meaningfully. Sadly the reality is

that in many cases portfolios are used as an assessment tool, or a showpiece, rather than a teaching and learning aid.

McLellan and Nichol (2007) suggest there is evidence of fixation, where pupils will use popular culture, stereotypical ideas and gender patterns, as their own design ideas. These ideas lack any form of creativity or originality. McLellan and Nichol (2007) go on to state that this is unsurprising, as pupils will draw from existing knowledge and that this does not necessarily mean a pupil is uncreative or lazy. However, it is the role of the teacher to adopt pedagogical approaches in order to overcome fixation.

In order to move away from fixated thinking, Stables (1992) recommends the use of fantasy as a starting point for design. Fantasy is "a skill that enables both the freedom for the mind to be creative, exploratory and prosperous" *(Stables, 1992, p.111)*. Stables argues that using "fantasy and reality simultaneously will push out the boundaries of possible, while mediating these ideas through a grip on reality" *(Stables, 1992, p.111)*

Welch & Barlex (2004) suggests alternative methods that could be used with, or instead of a portfolio, to increase pupil creativity. One such method is a sketchbook. Welch notes that a sketchbook can help students to develop self-awareness and skills as independent learners. In addition, a sketchbook can help to develop creativity and design work, without the same level of presentation required in a portfolio. Sketchbooks may help to resolve conflict between learning and assessment. However, there is a danger that pupils may not recognise the benefits of this method, and without the teacher's guidance and intervention the sketchbook may remain mostly blank.

It is apparent that many barriers exist to the advancement and development of creativity in T&D. Pupil ability, curriculum requirements and classroom climate all have an important role to play in the development of creativity and design. It is widely considered that the teacher holds the key to change in nurturing creativity. There is an ever evolving challenge, in which teachers must adapt to their pupils' individual and collective needs and diverse creative backgrounds, in order for the subject of T&D to remain current and credible. This literature review has been an invaluable tool in assisting me to focus my research on creativity and design, thus formulating the following research questions:

1. In what way do T&D teachers perceive that design folders enhance creativity?
2. Is the design folder, a truly creative document, suitable for all pupils in T&D?

3.0 Methodology

The aim of this study is to analyse perceptions of creativity within a design folder. Research will be carried out to ascertain whether the design folder promotes creativity to all pupils studying T&D. Research as described by Kumar (2008) can be considered as an original contribution used to enhance existing knowledge. The following methodology will discuss the methods of research that will be employed to answer the above research questions.

3.1 Research Methods

Before carrying out research, it is important to first acknowledge the various methods that are available. Research methods can be placed into two basic categories: qualitative and quantitative.

> "Qualitative research is a research strategy that usually emphasises words rather than quantification in the collection and analysis of data" *(Bryman, 1999, p.366).*

Quantitative research is defined as "explaining phenomena by collecting numerical data that are analysed using mathematical based methods" *(Muijs, 2004, p.1).* Bryman succinctly summarises qualitative research concerning itself with exploring issues, gaining in depth understanding by human experiences, opinions and perceptions. Luton (2010) supports Nykiel stating "qualitative research approaches offer distinct advantages to researchers seeking to engage practitioners in order to gain knowledge of and with them". *(Luton, 2010, p.13)* As this study is based on creativity, which has a broad definition, I feel that qualitative research is an appropriate option given the strict time frame.

3.2 Qualitative Research Methods

In order to successfully acquire relevant information for this study, it is important that the correct qualitative research methods are chosen. These methods include focus groups, interviews and questionnaires. This section will compare and contrast these research methods.

> "A focus group is a special type of group in terms of purpose, size, composition, and procedures. Participants are selected because they have certain characteristics in common that relate to the topic of the focus" *(Kruegar & Casey, 2000, p.4).*

Denscome (2005) highlights problems that can arise from focus groups. "Members who regard their opinions as contrary to prevailing opinion within the group might be inclined to keep quiet or moderate their views somewhat."(Denscombe cited in Bell, 2005, p.163).
It is important that the focus group members have been chosen appropriately, as the essence of group dynamics can have a negative influence on findings. Upon reflection, a focus group may prove problematic in conducting this study. Realistically, it would be extremely difficult to gather teachers together in a focus group, due to their work and family commitments. In light of this, focus groups may not be a suitable for this study.

Questionnaires can provide quick, objective results that can be easily quantified by the researcher. Popper (2004) states that questionnaires can be analysed with greater accuracy, compared with interviews, and that a large amount of data can be gathered quickly, thus allowing new theories to be presented with greater ease. However, Kaar (2009) is wary of questionnaires, as they can often provide generic answers, which may nullify elements of the research. Kaar (2009) feels that in depth interviews help to enable deeper understanding of the research. "(Researchers) get a deep insight into the whole story, which empowers them to become an active part of the research process."
(Kaar, 2009 p.3). Bell, (2005) too, highlights another important advantage of interviews. He states that interviewee response in the form of voice, intonation and body language can provide information that written research would conceal. However, Amos-Hatch (2002) and Murray-Thomas (2003) are both concerned with potential flaws in the interview process. Amos-Hatch warns about misrepresentation from not knowing the answer, or poor interpretation of an answer. This can lead to poor recall of event details, which can combine to create a version of truth with part fiction to cover gaps. Murray-Thomas believes that an interview can be ineffective if the respondent finds the question too personal, or the researcher imposes his or her own viewpoint on responses.

3.3 The interview Process

Type of interview

Structured and semi-structured interviews are the two main types of interview that can be conducted. Before carrying out the interview process it is necessary to determine which method is appropriate for this study. Structured interviews have a fixed format in which set questions are prepared, and delivered in a sequential format. This interview style prevents conversation flow, although it is precise. This would not be appropriate in this study, as it is vital to engage in conversation about creativity without restrictions imposed, allowing the interviewee to give their opinions and recommendations openly. This is highlighted by Amos-Hatch (2002) in which he states the importance of two-way conversation between participants that allows the interviewee to respond freely, and make them feel their contribution is being listened to. Grix (2001) also supports this interview type. "Semi-structured interviews allow a certain degree of flexibility and allow for the pursuit of unexpected lines of enquiry during the interview" *(Grix, 2001, p.76).*

3.4 Ethical Practice

In preparation for the interview process, it is necessary to be aware of any ethical issues that may arise, and a number of procedures were taken to ensure this. This included compliance with the Queen's University Ethical Code of Practice. A pilot interview was carried out to determine whether questions were clear and concise. In addition, consent for interview and recording was obtained. "It is good practice to get written confirmation from the participants that they understand what is required and agree to take part." *(Walliman, 2011, p.252)*

4.0 Presentation and Analysis of Data

4.1 Introduction

The following analysis is based upon the semi-structured interviews that were carried out for this independent study. Four teachers were interviewed, these teachers are noted as Teacher A, Teacher B, Teacher C and Teacher D. The subsections discuss the key themes that arose from the interviews.

4.2 Opportunities for pupil creativity in the design folder

All four teachers expressed thorough and informed opinions about the variety of opportunities for pupils to express creativity within the design folder. Teacher A noted that in his school, a specific teaching unit is devoted to carrying out a product re-design. A design folder is completed; however, the manufacturing process is omitted. This allows the pupils to spend more time on idea generation and developmental stages of design. In addition, the pupils do not have to worry about manufacturing or material limitations; therefore, the pupil has control over how creative or innovative they would like their designs to be. This example is in direct contract to Welch and Barlex (2005) in which they state that teachers are restricted by exam boards and curricula. Teacher B highlighted the need for 'blue sky thinking' when completing the design folder. Blue sky thinking is a process that involves generating ideas that are free from restriction or rules. Teacher B is of the opinion that creativity cannot be fostered by imposing restrictions on pupils. Allowing pupils to come up with "radical and wacky" designs, that will never be critiqued or manufactured, allows the pupils the opportunity to express themselves without restriction. However, teacher B did stress that this task was completed during Key Stage 3, where there curriculum restrictions are less stringent. Blue sky thinking is a concept supported by Stables (1992) where she recommends that pupils 'engage with fantasy' to help generate creative thought.

All four teachers expressed opinions on the core opportunities for pupils to express creativity through a design folder. All interviewees talked about using 'thought showers' as a means of generating 'blue sky thinking', as initially expressed by Teacher B. A thought shower in T&D is a process for generating creative concepts, by recording a number of ideas that an individual or a group may have. The ideas are generally hand written, and are often

accompanied by rough doodle sketches. All four teachers felt that this method was beneficial for use in all year groups, helping pupils to gradually develop their creative thoughts on a particular topic or design area. Teacher B explained how he uses thought showers at the initial stage of design as a group activity. "It (thought shower) transforms the classroom into a pool for creativity, where pupils offer remarkable or sometimes bizarre ideas!" McLellan and Nicholl (2008) support the freedom of this strategy.

Again, all interviewees noted doodles as a method used in their classroom which offers pupils opportunities to be creative. Doodles are small rough sketches that are used to help pupils visualize ideas and clarify thinking. Teacher C noted that doodles are particularly beneficial to pupils in the classroom who may struggle with drawing skills. "The benefit of a doodle is that the drawing is not expected to be perfect. It helps to clarify pupil thinking and supports the pupil who lacks drawing confidence."

Within the T&D folder, concept sketches provide the pupils with the ideal opportunity to be creative. These generally consist of one-two A3 pages of sketches, outlining different possible ideas of shape, size, form, ergonomics, aesthetics and colour. Each sketch should be annotated, giving a brief outline of its characteristics. All interviewees accepted concept sketches as an obvious method of creative opportunity in the design folder. Teacher A stated that concept sketches not only allow the pupils to develop their creative drawing skills but also hone in on design and possible assembly. "Concept sketches require pupils to actively process their ideas. While drawing they creatively think about the whole design process, such as shape, fit, features and not just the sketch on the page" (Teacher A)

Teachers A, B and C felt that the Computer Aided Design (CAD) package Solid Works offered the pupils the greatest opportunity to express their creativity, which is then presented through their design folder. "Solid Works allows pupil designs to come to life. They can clearly see areas that may prove troublesome when manufacturing and it helps them to visualise how their product will look." (Teacher B). "The pupils are aware of the benefits of using Solid Works. They want to be involved with modern, digital design software. The pupils feel a sense of pride and ownership learning a new command on Solid Works that will enhance or bring another dimension to their design" (Teacher C). Teacher C notes that Solid works twinned with the laser cutter has undoubtedly helped to raise standards in T&D.

"Pupils are now aware that the designs they produce have the potential to be made quickly, through solid works and the laser cutter." Teachers A, B and C all were in agreement that the functions of a laser cutter combined with Solid Works skills have had a positive impact on the design folder. They noted that each design on Solid Works can be rendered to look highly realistic, and also have the facility to include numerous views and sections. Often, pupil design folders (with respect to Solid Works) could be mistaken for Product Design Portfolios. Due to the speed at which designs can be manipulated, this contradicts Welch and Barlex's (2004) point that students are spending vast amounts of time on presentation, at the expense of designing. Teacher D did not have the luxury of having Solid Works in her school. Nevertheless, she felt that Solid Works presented a barrier, rather than an opportunity to creativity. "Often CAD packages have design limitations where a pencil does not. I feel that true creativity should not have limitations, it should be like art. As long as a pupil can justify their reasons and why they have chosen them then creativity is present." Morgan et al (2013) support the need for hand drawn design, suggesting that designing using software is limiting the development of spontaneous drawing.

Teacher A felt that the T&D department in his school provided opportunities for creativity in the design folder by introducing and developing creative skills from the onset of Post Primary education. "From Year 8 we try to develop the pupils' skills in sketching, shading and CAD. This is then married with creative thinking skills, designing and manufacturing skills. When all of these skills are intertwined, creativity in the design folder blossoms." This method developing creativity from an early age is supported by Bloom et al (1956) as they claim that creativity must be nurtured as it is the highest order cognitive process.

4.2 Barriers for pupil creativity in the design folder

Kimbell (2000) expressed concern about the method of delivery in T&D classrooms. He felt the step by step approach to design, in relation to design folders, is outdated and that a more holistic strategy exploring a wider range of techniques would be more beneficial. Kimbell's viewpoints were shared by teacher A during the interview. He felt the 'regimented' and 'orderly' nature of the design folder restricts pupils from being unique when designing, which therefore has an adverse effect on creativity. Teacher B expressed a similar view stating that "structured creativity is awarded, while freedom and imagination is not." McLellan and Nicholl (2009) share the sentiments of teachers A and B stating that

"students doing design work in D&T are simply guided through the design problem via a series of discrete procedural tasks" *(McLellan & Nicholl, 2009, p.89)*

Half of the teachers interviewed considered time constraints as a barrier to creativity in the design folder. Due to time restrictions, pupils will often complete their design sketches as part of a homework task. Teacher C noted that only the conscientious pupil will take time to consider a range of designs. Teacher B explained that his class time was needed to "teach theory" and "demonstrate workshop practices", and that design folder work was "nearly always" a homework activity. Because of this both teachers B and C appreciated that the quality of designs did suffer. Teacher C stated "I am fully aware that the majority of pupils will bash out something quickly onto a page, without much thought". This supports Davies' (1996) claim that pupils fail to engage in aspects of T&D as they are not interested in many of the design tasks they must complete. McLellan and Nichol (2007) note that pupils will use Google Images or Argos catalogues as a means of generating designs. Teacher D felt that modern society had a role to play with respect to time. She suggested that children find it difficult to relax and take time to reflect upon many aspects of life; this then has a subsequent effect in the classroom. "Time is always against us, and the reality is that unique designs are not something that can be conceived in a 15 minute T&D activity." This would seem to support Bloom et al (1956) who claim that creativity is a cognitive process of the highest order which must be nurtured. Teacher A is of the opinion that pupils are less likely to be artistic or creative with their designs because of the time limits imposed upon them.

Plagiarism was considered a barrier to creativity within the folder by Teachers A and D. Both admitted to freely showing pupils examples of high quality design folders, when pupils expressed themselves as being "stuck" on a particular section or design. These folders were often on display in the classroom, free for all pupils to browse. This would support Craft's (2004) statement where the teacher must be fully engaged in creativity in order for the pupil to express it. Teacher A noted a small minority of pupils select a project solely on the basis that their "brother, cousin or friend completed the same project a year or two previous." The design folder is then replicated, void of any original thinking or creative design. This is supported by Lucas *(cited in Craft 2004)* where he recognises the need to be challenged in creative learning.

Teacher A and B felt that exam boards proved a barrier to creativity in the design folder. Both teachers had a similar view to Klenowski (2002) in concluding that the design folder is an assessment tool rather than a teaching and learning aid. Teacher A is of the opinion that the design folder is "just another piece of coursework" and that the exam boards should "loosen the overall structure, allowing pupils more opportunities to express themselves". Teacher B noted that the exam board does not account for originality of thought. "Without doubt certain exam boards restrict creativity" Pupils are required to "regurgitate information relating to material properties or manufacturing processes in order to fill a page in the folder".

The role of the teacher undoubtedly has an impact on pupil creativity. During the interview process Teacher A argued that the mindset of the teacher will ultimately dictate what the pupil produces. In addition, Teacher A also noted that pupils are always in pursuit of the right answer. "If the pupils are trying to acquire predetermined 'right' answers creativity will be discouraged, even if not consciously, by the teacher." Van Oech (1998) is in agreement, stating that design has many right answers or can be ambiguous. In addition, McLellan and Nicholl (2009) note that many tasks lack ambiguity and risk, which are required to develop higher order thinking. Ultimately, this is the responsibility of the teacher.

A lack of meaningful reflection and evaluation was considered a barrier to creativity by Teacher D. She felt that once the product is completed pupils are not motivated to assess their product. "Product evaluation is always a rushed activity". Teacher D feels that more emphasis should be placed on design after the product has been manufactured. "Pupils need to take the time to reflect on what they have done, what have they learned and areas for development". Teacher D recommends that pupils should be completing reflective documents similar to those used by teachers. Mitchell et al (2003) agree that reflection is an important element of design folders. Reflection "is a tool to enhance learning both as work progresses and summatively is seen as important in the taught (T&D) module" *(Mitchell et al, 2003, p. 87).*

4.3 Inclusive Practice

All interviewees were in agreement that the T&D folder is a creative document which is inclusive of all attainment levels. However, to achieve this, the teachers noted that certain strategies must be initiated. Teachers A, B and C commented on the differentiation technique used in their classroom to ensure mixed ability pupils are catered for. Teacher A stated that differentiation in T&D is 'unique' to that of other subjects. He noted that 'highly intelligent' pupils can struggle with aspects of the subject, such as manufacturing, designing and sketching. "Often pupils have the choice as to whether they would like to complete their design folder free hand, electronically or a combination of both". Teacher A also stated that some pupils have "no patience for drawing" while other pupils are "technophobes"; therefore it is necessary to use differentiation techniques when completing design pages for the folder. This method is supported by Welch and Barlex (2004) where alternative methods should be used to increase pupil creativity. Teacher B felt that differentiation by task was difficult to implement in T&D; however, pupils appreciated extra support with manufacturing activities. "The pupils who need differentiated do not want to manufacture another product, although, they appreciate that they need a little extra help with processes such as drilling or sanding". Teacher B's teaching strategy is in direct contrast to that of Horrell's (1998). He recommends differentiation by task, where Special Educational Needs (SEN) pupils in T&D should have the option of completing other, less complex projects.

In order to promote creativity in the design folder, Teacher C recommended the SCAMPER technique. SCAMPER is an acronym of Substitute, Combine, Adapt, Magnify, Put to other use, Eliminate and Rearrange. These seven steps are used to spark creativity and help overcome design challenges or mental blocks. This technique is based on the idea that everything exists, therefore pupils can play with and alter the characteristics of products to trigger new ideas. Teacher C noted that this technique is particularly useful in the initial stages of design. The use of varied techniques is a strategy supported by Robinson (1999) and McLellan and Nicholl (2009) where they note that a good teacher will recognise young people's creative capacities and will therefore adapt his or her teaching style in order to develop creativity.

Teacher A noted that classroom environment, although not a specific technique, is important for developing pupil creativity. "A stimulated environment makes for a stimulated pupil." If the classroom is one where a pupil "feels at ease" and is "motivated and inspired by what they see around them" the pupils are more likely to produce creative and original ideas. This is supported by Craft (2004) "Young people's creative abilities are most likely to be developed in an atmosphere which the teachers' creative abilities are properly engaged" *(Craft, 2004, p.2)*

To achieve a creative environment, Teacher A ensured that his classroom contained current wall displays of pupil design work, design portfolios "dotted" around the classroom and completed projects. Teacher A noted that having manufactured products available in the classroom allowed pupils to "dismantle the product and help them to understand how each part has been manufactured and assembled". Finally, teacher A felt that the use of a radio had a positive effect on creative design in the classroom. He noted that often during design work there was a "deathly silence" and that this did not promote creative design work. Listening to music at a low volume "helps the pupils to completely relax and to chat casually about their concepts and ideas". This strategy adopted by Teacher A complements the viewpoints of Nichol (2004) in which he states that "teachers hold the creative key, to the creative door, through which pupils access the creative aspects of the domain" *(Nicholl, 2004, p.2)*

5.0 Conclusion

Analysis of the data collected indicated that there are notable similarities between interviewees and literature about the perceptions of creativity in the design folder. Although all the interviewees were reasonably positive about the overall structure and format of the design folder, each interviewee had an objection to at least one element of the design folder.

The majority of teachers indicated that the pressure of results was the main barrier to creative practice within the design folder. It was noted that in many cases the pupils are required to follow a rigid format and any attempt at individuality is discouraged in the push for maximum marks. McLellan and Nicholl (2008) state that challenge and autonomy are core needs that need to be met in order to develop freedom and motivation, which are prerequisites for creativity. Nevertheless, the interviewees freely admitted that pupil grades take higher precedence than creative design, and at the end of the school year the teacher is ultimately judged on their pupils' grades. This reinforces the argument put forward by McLellan and Nicholl (2008) which states that the current educational culture of results has a direct impact on creativity in T&D.

All the teachers interviewed indicated that the design folder has some opportunities for pupils to express 'controlled' creativity. For the most part, this was through sketching and graphical drawings, in the concept and design ideas section of the folder. The majority of teachers felt that CAD package Solid Works had a significant impact on creativity in the design folder. This was due to the speed at which designs can be drawn, rendered and manipulated, allowing pupils to produce high quality work that 'could be mistaken for Product Design Portfolios' (Teacher C). By contrast, Welch (2004) noted that pupils spend vast amounts of time on presentation of the design folder at the expense of creativity. However, the majority of teachers were in agreement that the Solid Works program improves pupil creativity without being too time consuming, and the pupils are benefiting from learning to use reputable design software. Three of the four teachers stated that 'uncontrolled' or 'novel' approaches can be risky and the pupil may encounter unforeseen difficulties in manufacture. Again the concept of 'controlled creativity' reflects McLellan and Nicholl's (2008) findings on the lack of challenge and autonomy within the design folder.

Kimbell (2000) too, feels that risk takers are not being sufficiently rewarded, which has led to many aspects of T&D becoming "dull and lifeless" *(Kimbell, 2000, p.211)*

Davies (1996), McLellan and Nicholl (2009), and Millar and McGimpsey (2011), all agreed that poor quality of teaching within T&D has contributed greatly to the lack of creativity in classrooms. Unsurprisingly, at no point did any teacher state that teaching creativity was a problem for them. Instead, all interviewees talked freely and positively about this topic, suggesting that creativity was an aspect of T&D that they all felt competent in delivering.

This study aimed to ascertain whether the design folder is a truly creative document, suitable for all attainment levels in T&D. None of the teachers explicitly stated whether they felt that the design folder was truly creative or otherwise, as each teacher felt that simple changes could be made to improve creativity. However, all teachers were in agreement that the design folder is suitable for all attainment levels. The teachers noted that although the design folder has a rigid structure, the pupils can complete each section in a variety of ways. Teacher A stated that "pupils have the choice as to whether they would like to complete their design folder free hand, electronically or a combination of both". The design folder can accommodate pupils of different abilities if it is used correctly. For example, some pupils may have a flair for graphics and will make use of that in their work. Others may be strong on analysis and gain credit for work that places emphasis on personal research and statistics. Some pupils with difficulties in literacy may find graphics more approachable than written work in other subjects. This element of choice is supported by Welch (2004) where alternative methods allow pupils to make their own decisions, thus promoting independence and increasing motivation.

The consensus among the teachers interviewed was that their own teaching strategies had an impact on improving pupil creativity. Using a range of techniques such as SCAMPER, Blue Sky Thinking, differentiation and listening to music, all helped each individual teacher to maximise creativity in his or her classroom. This is supported by Craft (2004) where she suggests that "young people's creative abilities are most likely to be developed in an atmosphere in which the teachers' creative abilities are properly engaged" (Teaching Creativity and Teaching for Creativity, Pg2). However, Millar and McGimpsey (2011) and Davies (1999) suggest that there is a need for T&D teachers to be taught design in order for

creativity to flourish in every school. McLellan and Nicholl (2009) are of the opinion that a number of teaching strategies do not provide students with the opportunities to use their cognitive skills to be creative. Teachers must be aware that creativity is a cognitive process of the highest order (Bloom et al 1956) and that the correct processes must be nurtured and developed in order to yield creative and original designs.

5.1 Recommendations

A teacher who wishes to encourage creativity must create the right environment for the pupils. It should be an environment in which mistakes, which are integral part of the learning process, are accepted and used to encourage the pupil's individual creativity. It should also be an environment where opportunities are created for team thinking and for building on a range of different contributions from individual ideas. It should be an environment with a wealth of stimulus materials across a range of media.

Teachers who create this environment must be purposeful and aware that this is what they are trying to achieve. They must be energetic leaders with skills in communication and motivation. They must have skills in rewarding and encouraging the kinds of activities and responses which they seek to develop in the pupils. They must show creativity and imagination in their own work and in the exemplars that they use with the pupils.

The current educational culture of high attainment has undoubtedly had a negative effect on creative practice in the design folder. Both literature and the interviews carried out suggest that pupils are unwilling to take risks and individuality may be discouraged, as this may have an affect the pupils' overall grades. Inevitably, the interviewees were untroubled about the lack of creativity in the design folder, as the primary goal was pupil grades.

Current literature on creativity suggests there is a need for teachers to be taught design, and for exam boards to recognise creativity. Half of the teachers interviewed recognised that much of their pupils' work lacked creativity. However, the teachers felt restricted by the educational culture of attainment results, and felt that a radical change in the classroom would be difficult to achieve in the short term.

This study has enabled me to understand both the academic and the teacher perceptions on pupil creativity within the design folder. I have gained insight into the problems faced by teachers and highlighted by academics on the subject of creativity. Literature suggests that the prime purpose of a design folder is to empower the pupil to generate and communicate ideas. However, the reality is that many teachers feel that the design folder is just another assessed piece of coursework that follows a ritualised format. Ideally, given extended time and a range of resources, I feel that quantitative research and/or focus groups with pupils

would be another essential strand of research. This would allow me to understand, and analyse, their opinions on the importance of creativity in the design folder.

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7.0 Appendices

Dear _____,

As part of my 4th Year Education Studies course, it is necessary that I complete a small scale study based on the topic of creativity. My area of focus is;

'Is the Technology and Design folder a Creative Document?'

In order to complete this assignment, I request your permission to carry out a small scale research study within the _____ teaching staff. For the purposes of completion, I would only require feedback from one staff member and any information which is provided will be treated in strict confidence. The staff members' name and that of the school will be anonymous in my final assignment which will only be used for assessment purposes.

Yours sincerely,
Brendan Hasson
St Mary's University College Belfast

Dear _____,

Thank you for agreeing to participate in my independent study. Please find a draft copy of the questions that I hope to ask and discuss during the interview.
What barriers to creativity exist during the process of completing a Technology and Design folder?

-What opportunities are there for pupils to express creativity when completing a folder?

-Do you feel the Technology and Design folder accommodates pupils of mixed abilities?

-What, if any, aspects of the Technology and Design folder would you change to enhance creativity?

-Is there an alternative method of assessment, other than a folder, that could be used to enhance opportunities for creativity?

-In your opinion do exam boards reward or restrict creativity?

-Are there any aspects of the Technology and Design folder that you feel serve little purpose?

-What skills do you employ to enhance creativity in the classroom?

-Many academics argue that the portfolio is a showpiece document, rather than a creative, working document. Do you agree with this? Why?

Yours sincerely,
Brendan Hasson
St Mary's University College Belfast

Dear _____,

Thank you for participating in my study. The insightful views which you provided were extremely beneficial and I am very grateful that you allowed the interview to take place.

Yours sincerely,

Brendan Hasson