

THE IMPACT OF CONVENTIONAL SCHOOL EDUCATION ON STUDENTS CREATIVITY

By

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ABSTRACT

Many academics argue that 'we don't grow into creativity we grow out of it, or rather we get educated out of it.' This research work investigates the notion that the education system is to blame for a loss of creativity in adults. As a result of the attempts to stifle creativity in schools, subjects including Design and Technology (D&T) face challenges in today's curriculum. Although the D&T subject is highly regarded and celebrated by many, helped by successful names such as the designer Dyson, it still suffers a bit of an image problem. Interviews have been carried out with both teachers and students to identify how and why the subject is being affected. With numerous factors working against DT; finance, the government, universities, tradition and more, it is not surprising that the subject fails to attract the interest levels it deserves. However, increasingly design should attract a greater awareness may reserve, in response to a shift towards a Britain that needs to be acknowledged for design and innovation.

Keywords: Creativity, School Education, Research, Motivation.

INTRODUCTION

This article will explore the view, initiated by Robinson (Robinson, 2006), that creativity is being stifled in the current education system and will address the impact this has on the value of design and technology as a subject. Encouraging creativity within education has made numerous headlines and been regularly discussed in the recent years. This, combined with the personal interest and committed investment to design and technology, made the topic relevant and appealing to study. As with many of the creative subjects, the significance of design and technology is often discussed. The literature and research will demonstrate this, but the emphasis will remain on how the subject is being affected. In order to achieve the specified objectives, literature will be used, in addition to primary research methods such as interviews. This research explores the relevance of design and technology.

1. Creativity at Children's Different Age

Some educators blame the education system is to blame for a loss of creativity in adults. Robinson talks passionately

about how schools are killing creativity, arguing that "we don't grow into creativity we grow out of it. Or rather we get educated out of it" (Robinson, 2006: 16). Picasso once said, "all children are born artists, the problem is to remain an artist as we grow up" (Robinson, 2006). Common knowledge suggests that if you are not prepared to be wrong you will never come up with anything original. Ken Robinson holds the belief that by the time they grow up, kids have lost that capacity and the thought of being wrong worries them; therefore "we are educating people out of their creative capacities" (Robinson, 2001: 16). Robinson's opinion suggests that children are more attracted to being creative, in the form of subjects, such as art, design, music, drama, and dance, when they are young. By the time they reach their late teens many of them have lost their ability to be creative due to the education system.

Dyson, the billionaire businessman and inventor, described himself as an arts man during his school years, "having grown to love art as a subject, in spite of the education system rather than because of it" (Dyson, 1997: 21), claiming that it was the only course at school that taught

him anything useful. He curses the iniquity of our education system that forces students into their subject choices at such a feckless age (Dyson, 1997: 23).

An article from The Telegraph highlights the threat to creative subjects in secondary schools after the failure to include an arts option in the new English Baccalaureate (EBacc) (Petroski, 2013). Introduced in 2010, the EBacc, is a key example of how the education system has an influence on the level of interest a child has in creative subjects post sixteen. It consists of five GCSE subjects, English, Mathematics, History or Geography, the Sciences and a Language. Figureheads from the arts believe that the arts and culture should be an essential part of education too. Bendetti, the classical violinist, argues that, "creative subjects should not be seen as second best or as options for those unable to cope with academic subjects, but should take their place alongside them within a broad and diverse curriculum" (Petroski, 2013).

Gove, Government's Education Secretary, has received criticism for his current plans for the national curriculum, accusing it of stifling the creativity of both students and teachers (Robinson, 2013). Our education system is predicated on the idea of academic ability. "Every education system on earth has the same hierarchy of subjects. At the top are mathematics and languages. Then the humanities and at the bottom are the arts" (Robinson, 2006). As children grow older, "we start to educate them from the waist up and then we focus on their heads and slightly to one side" (Robinson, 2006).

In line with Robinson's way of thinking, the book, 'New Kinds of Smart' argues the demand to broaden our idea of intelligence to include, "hands and feet as well as ears and thoughts" (Lucas and Claxton, 2010: 179). Their belief lies with societies needing, "makers and doers as much as, if not more than, their lawyers and professors" (Lucas and Claxton, 2010: 179). However, the problem lies with the issue that there are few ministers, MP's or officials who have experience with working within an arts related field, and this lack of experience inevitably influences political direction (Ofield-Kerr, 2013).

The literature presented demonstrates that the arts are not receiving the recognition they deserve in education. This

results in many talented creative adults believing they are not creative. Evidence suggests that creative talent is not always encouraged or valued at school, explaining the loss of interest in creativity by the age of seventeen. Creative subjects often lose their attraction post sixteen, due to the pressures faced in the education system. This has a direct effect on the interest invested in design and technology as a subject.

2. The Relevance of Modern Design Education

"In the next thirty years according to UNESCO, more people worldwide will be graduating from education since the beginning of history. Suddenly degrees aren't worth anything" (Robinson, 2006). There is a great urgency to radically rethink our view of intelligence, in response to this form of academic inflation. A discussion between three top-thinkers about the future of design and innovation, recorded in the new design magazine, demonstrated the importance of design today, "agreeing that today there is greater awareness of design than ever before" (Wilson, 2012: 28).

Dyson however, is the first to admit that, as a subject, design and technology still suffers a bit of an image problem; "probably due to its origins in the school wood workshop, when there was no notion of design and everyone had to make wooden matchbox holders" (Dyson, 1997). However, Dyson, one of the most high-profile entrepreneurs representing Britain's creative and manufacturing industries, argues that "design and technology is a very important subject and sits alongside Mathematics, Physics, and Chemistry" (Seymour et al., 2011). In education, design is regarded as having a lower intellectual level than science. Yet, "in reality, engineering design needs higher levels of intellectual ability because it must embrace science and go beyond it" (Petroski, 2013: 13). This way of thinking is acknowledged by the following advocates. Evans, Head teacher of Warsall Academy, recognizes that, "if we do not commit to an education, which embraces design and technology teaching, we would be denying youngsters an opportunity for work in the future" (Seymour et al., 2011). Rose, former Chief Executive of Rolls Royce, believes that "the great thing about design and technology as a discipline is that it allows young people to

relate to the academic subjects, that can be a bit dry, to making things work, to creating solutions" (Seymour et al., 2011).

Reports of the design and technology led approach are positive, rewarding the subject for the increase of children's motivation and attitude towards numeracy and literacy. It allows children to relate their academic studies in a practical way to real solutions. Callum, the design director of Jaguar, "resents the idea that design and technology is a lesser subject than Mathematics and English, because it's not" (Seymour et al., 2011). Osbourne recently stated that he wanted Britain to be renowned for designing, making, and inventing goods in Britain (O'flynn, 2012). "Well how is that going to happen if design and technology is not at the fore-front of the curriculum?" (Seymour et al., 2011).

Contrary to the voices and opinions of several successful members of industry, Russell Group Universities refuse to treat design and technology as a facilitating subject to study at A-Level. Both Cambridge and LSE University disregard design as a subject, defining it as 'soft' or non-preferable (Studentladder.co.uk, 2013). The CBI states that the current design and technology curriculum "is out of step with the needs of a modern economy. It lacks academic and technical rigor, as well as clear links to the realities of the workplace" (Buckler, 2013).

3. Design and Technology at the Present

Although highly valued by many, design and technology is regarded as a 'soft' subject by some universities today, diminishing its status in the curriculum. A report produced by the Department of Education states that the English Baccalaureate has directly resulted in 14% of schools withdrawing design and technology as a subject. To relate this proportion into a number, the figure represents 151 schools, which approximately corresponds to 19,000 students being deprived the opportunity to study it (Stuart, 2012).

According to an article in The Guardian in 2010, after Maths, English, and Science, the most popular GCSE subject is Design & Technology (Ratcliffe, 2013). However, the number of students pursuing the subject to A-level continues to decline in popularity, falling by 8.5% in 2013, compared to 2012 (Chalabi, 2013). Evidently the subject is

proving popular up until the age of sixteen; however, interest rapidly decreases in design post GCSE despite the strong need for design in the world today.

4. Methodology

The main aim of this article is to investigate Robinson's view that schools are killing creativity and to address the impact this has on the value of design and technology as a subject.

The objectives were:

- To investigate the notion that the education system is to blame for a loss of creativity in adults.
- To explore the importance of design and technology in today's curriculum.
- To determine the effect on design and technology as a subject, as a result of the attempts to stifle creativity in schools.

Research questions were:

- Are children more attracted to creativity at the age of seven than seventeen?
- What is the relevance of design education today?
- In what ways is design and technology as a subject being affected in today's curriculum?

A gap in the literature demonstrated the need to carry out suitable research, using an appropriate method. The aim of carrying out this primary research was to address the value of design and technology in education and assess the ways that it is being affected. Interviews were chosen as the appropriate method of research. Specific questions were asked, creating a relatively structured interview, yet allowing for flexibility in the response. The interview provided qualitative feedback, therefore gaining a subjective understanding of the interviewee's opinion.

Interviews were carried out with teachers and students. The importance of both teachers and students are included in the participants to provide perspectives across the age groups. A total of six design and technology teachers, from various schools were interviewed, along with a combination of students who chose to pursue design after school and students who chose to drop the subject after A-level. This presented a balance of results from a wide

variety of perspectives. The interviews lasted 20 minutes and were carried out with the following teachers all from 6 different schools.

A total of ten interviews were conducted to students. This included five students who had chosen to pursue design after school and five students who decided to drop the subject after A-level. The purpose of interviewing the students was to gain an insight into their opinions on the subject and to more specifically determine why they chose to pursue or not pursue the subject. Each interview took approximately 20 minutes and included 12 questions. The following students chose to pursue design and technology after studying it for. These interviews have provided crucial information, filling the gaps in the research highlighted in the literature review. The results and answers provide a range of insights from students and teachers with different school types, backgrounds, and levels of experience.

Grounded theory was used for working with the data. The core of grounded theory data analysis is a continuous coding procedure. Analysis will start with open coding - the data are examined step by step to define actions or events within the data. This coding analysis will likely lead to "refining and specifying any borrowed existing concepts" (Strauss and Corbin, 1998: 37). Next, there is axial coding, which is meant to build conceptual relations between a category and its subcategories. Then, concepts and sub-concepts are further defined by selective coding, "an integrative process of selecting the core category, systematically relating it to other categories, validating those relationships by searching for confirming and disconfirming examples, and filling in categories that needed further modification and development" (Strauss and Corbin, 1998: 39).

Codes and categories will be sorted, compared, and contrasted until all the data are accounted for in the core categories of the grounded theory model, and no new codes or categories can be formed, i.e. saturation is reached (Bernard, 2002). The researcher also needs to write analytic and self-reflective memoranda to document and enrich the analytical procedure, to make understood thoughts clear, and to expand the data quantity. Analytical memoranda consist of questions and

speculation about the data and emerging theory.

5. Discussing the Results

5.1 *The Social Reality of Design and Technology*

Top universities are reluctant to treat DT as a valuable subject to study. Despite this, the subject draws many advocates, regarding it as absolutely critical for our future. The results led to the following findings:

- The subject is essential.
- Britain needs designers.
- The British design industry is successful.

5.1.1 *The Subject is Essential*

The results gained through interviewing design and technology teachers and students, presented valuable material defending the importance of design education today.

Design and Technology is commonly acknowledged as a unique subject. According to one of the interviews it is, "what design has to offer is a unique contribution within the curriculum, developing skills, such as project planning, practical aptitude and a structured approach to problem solving". The subject is diverse and covers a breadth of features. Another interviewee's highlights that "it develops a skills set that not only affords examination success, but skills required for lifelong learning and employment beyond school". Learning through doing, particularly when using the application of scientific principle is unique to DT. Design overlaps with many cross-curricular and collaborative STEM (Science, Technology, Engineering, and Mathematics) activities. It draws upon other subject knowledge, allowing students to apply their academic studies in a practical way to real solutions. This is in accordance to DATA's description of the program. "Design and Technology is about providing opportunities for students to develop their capability, combining their designing and making skills with knowledge and understanding in order to create quality products" (Data.org.uk, 2013). For many of the students interviewed, their experience of the subject was not too dissimilar from this description. One of the interviewees considers design and technology A-Level to have good future prospects, preparing a route for design related courses, Engineering and Architecture. Another of the

interviewee's chose to pursue product design to degree level because of its prospects. "I didn't want to study something generic like History or English as I felt design had better prospects for a career path and was a more interesting choice".

5.1.2 Britain needs Designers

"Designing terms of thinking and process is the champion of the future" (Bibby, S. 2013: 44). In the recent 2014 Budget Speech, Osborne emphasised his ambition to have everything "Made in Britain" (Gov.uk, 2014). To secure Britain's economic future, the return to a Britain that makes things again is critical. Graham realizes the risk involved. He believes, "Britain will gradually become poorer during the coming decades as the less developed nations increasingly become able to do what we have taught them to do. If we do not keep forging ahead we will become the third world of tomorrow".

With the emphasis placed on the makers and doers, the importance of design in education needs to be stressed. "In the grand scheme of things in the economy, design is extremely important. You need people who can use science and maths and engineering to turn an idea into reality" (Seymour et al., 2011). Dealing with such fast moving technologies requires the problem solving skills design encompasses. "What I would say to government, is if you want to have innovation in the UK, don't cut design education off at the knees. You can't have one without the other and that goes right back to design and technology in schools" (Seymour et al., 2011).

Due to this demand to return to a Britain who makes things, in order to boost the economy, design and technology must not be side-lined. If the subject continues to suffer in reputation, where will the next generation of engineers, designers and inventors get their inspiration from?

5.1.3 The British Design Industry is Successful

One of the interviewee's highlighted the history and current success of the British design industry, when discussing the justification for DT in the curriculum. There are several successful designers and engineers who are renowned for their inventiveness and contribution to the design industry. Dyson is one of them. "His story is an object lesson in how companies who overlook the value of design do so at their

peril" (Dyson, 1997: 2). Most famous for his invention of the dual cyclone bag less vacuum cleaner, Dyson has made a success story through his investment in industrial design and engineering principles. Although he initially followed his passion for art, he very quickly found himself being squeezed into the direction of product design, and then combined this with engineering. Admittedly, at the time of his graduation, "there was no insecurity attached to the notion of unemployment. It mattered not a jot that I had changed courses continually" (Dyson, 1997: 51). Hence, there was little pressure or urgency to find the dream job. In the late 1970's Dyson initiated the idea of using cyclonic separation to produce a vacuum cleaner. "After hundred of prototypes, thousands of modifications, and millions of tests" (Dyson, 1997: 1) he had accomplished his great breakthrough in over ten years. This success led to sales of more than £1 billion worldwide.

Dyson's success story is one which emphasizes the relevance of design and technology in education today. Not only will leading inventors and designers help encourage and inspire young people to follow, they will also open the minds of those who disregard the subject. As one of the interviewees put it, "celebrating good design through exhibitions and awards and getting leading designers and manufacturers into schools to talk about their work," is a step in the right direction.

5.2 In What ways is Design and Technology as a Subject being affected in Today's Curriculum?

This section is dedicated to discussing how design and technology is being affected in education and suggests what steps could be taken to improve the status of DT today. The results from the interviews highlight the main headwinds facing the subject. This section will include individual chapters on the following:

- The governments misunderstanding
- Image of the subject
- Universities
- Intellectual content
- Teaching
- Finance

5.2.1 *The Government's Misunderstanding*

As described by one of the interviewees, there seems to be a definite lack of awareness amongst policy and decision makers about the nature of design and technology. It is true that there are few ministers or MP's who have any form of experience in the subject, inevitably this influences their view on its importance. This was evident in the original program of study proposed by the Department for Education (DfE) in early 2013. It was put out for a consultation period of 5 months and received large amounts of criticism from successful industrialists, such as Dyson and relevant organisations, including The Design Council and DATA. "The short-sightedness and oversimplistic approach to the suggested new design curriculum, effectively demoted subjects like Design and Technology to ones of lesser importance" (Bibby, 2013: 45). This caused the DfE to revise the program of study for design and technology, "ensuring that it is a rigorous and forward-looking subject that sets children up on a path to be the next generation of designers and engineers" (Gov.uk, 2013). However, this rewrite only occurred because of a public uproar.

Clearly the subject has divided opinion regarding its importance in education. Those who actually understand what the subject entails believe, "modern design and technology should sit alongside science and maths. And it should have the academic rigour of engineering, attracting the brightest minds" (Seymour et al., 2011). In contrast, MP's, officials and ministers portray DT as a, "make do and mend" (DATA's response) subject comprising bike maintenance and toaster repair". This perception that DT is regarded as a craft and not a third science is degrading. As a consequence, it's almost as though, "we are fighting the whole British culture", making it difficult to attract people to study DT.

5.2.2 *Image of the Subject*

How the government perceives the subject, can be largely connected to tradition? As Dyson admits, design and technology still suffers an image problem due to its origins in the school wood workshop. People stigmatize the subject, regarding it as less worthy than others, due to the practical skill involved. One of the interviewees believes this

is, "in part historical but seems to be engrained within some academic establishments". For a parent at an open day to ask, "how many famous cabinet makers have you had coming out of here?" gives the impression that society still associates the subject with manual work, rather than a professional career. This explains why many students disregard the subject, even though they are good at it. This perception is rather difficult to avoid when a department is run by someone who's initial career was a builder, and hence their skill set revolves around wood work and making things. Brooks experienced this whilst studying for his A-level design and technology. The image of the subject presented to the students at this school, would have been one of limited future prospects, hence a class of only four at A-level.

Society perceives a designer to have a "magical quality rather than genuine expertise. Whilst nominal interest may be expressed by the parental body in design education, it is seldom more than at periphery of an educational experience". This view, of course, filters down to the student, diminishing the status of the subject.

5.2.3 *Universities*

As indicated by one of the interviewees, "some universities are suspicious of low quality DT education and devalue the whole subject as a result". This is the case with both Cambridge and LSE University, who disregard the subject as soft. The same interviewees argues for clarity in the message "that Product Design A-level is considered a facilitating A-level when taken in conjunction with the more traditional academic subjects such as physics and maths". In other words, until all Russell Group Universities regard DT as an appropriate A-Level for engineering it will continue to struggle for parity.

This has a large impact on whether a student decides to continue the study of DT to A-level. As proven by the interviews carried out, design and technology was sometimes considered a subject, which would close doors, rather than open them. One of the interviewees, received this pressure from parents and teachers alike yet pursued the subject because he enjoyed it.

5.2.4 *Intellectual Content*

Repeatedly, the interviewees commented on the lack of

academic and technical rigour involved in the subject. The current draft for the design and technology programme ensures that, "pupils design and make well-crafted products that are fit for purpose, but fails to achieve a more in-depth look at the subject content" (Bibby, 2013: 44). A number of campaigners have concerns that the subject area is being undermined, lacks ambition, and fails to challenge students sufficiently. This view was shared amongst nearly all the students interviewed. One of the interviewees commented on how little she felt challenged academically. "It was challenging in terms of the sheer amount of course work expected. But academically the work was not at all difficult, failing to push my mental ability". Ben goes as far to say he regrets studying DT at A-level "It didn't help me out much and limited my choice when choosing my degree as the universities disregarded it as a valuable subject. It was not particularly challenging, hence I would have preferred the combination of Physics, Maths, and Economics, which would have pushed me more intellectually". Feedback from the teachers similarly reflected this. Julian is aware that "the intellectual content of the discipline has been dumbed down over the years". One of the interviewees believes, "we need to return to a rigorous DT curriculum which raises standards and expectations". If DT is a demanding activity, challenging the most able candidates, which it should be, the status of the subject will be enhanced.

5.2.5 Teaching

In order to improve the academic status of the subject, departments need to have a successful blend of skills. According to one of the interviewees "more teachers need to grasp the technical bull by the horns and improve their skill set with regard to the electronic, computer programming, and maths/physics side of DT.

Although the subject can be wonderfully creative and artistic, you need your engineering nitty gritty too". One of the interviewees also recognizes the difficulty in appointing good, well-rounded and forward-thinking design teachers. "They remain few and far between. Many still have a legacy skill set from bygone eras and are reluctant to move on". Departments cannot afford to represent design and technology in this image. The subject needs to be well

taught and inspiring, providing students with a view that DT is an exciting, creative subject area with the potential for invention and imagination.

5.2.6 Finance

According to the majority of teachers interviewed, finance has a large impact in delivering a strong DT education. One of the interviewees regards DT as, "very expensive to resource with few institutions able or willing to commit the necessary investment". Another of the interviewees shares this view. "DT is expensive and it seems that increasingly, DT departments have to justify their existence, particularly in the face of escalating costs". Although this is not much of an issue if you are teaching in a school with a specialist status in technology, "in some schools DT departments are under threat because of the costs they incur".

A lack of resources within the department, due to the rising costs of materials, equipment and machinery will naturally affect interest levels in the subject. A student interviewee, studied at a Public School, where funding for the department was readily available. A total of 19 students did DT for A-level when one of the students attended. On the contrary, one of the interviewees studied at a comprehensive, state school where there was no support financially for the subject. "The machinery was not well equipped and there was no budget to spend on materials. All our wood came from the reject pile at B&Q". One of the interviewees studied DT for A-level, along with only three other students. Evidently, the contrast in interest in the subject is dependent on the resources and funding available for the department. "Investment necessarily includes plant, equipment and software. This is phenomenally expensive and requires regular upgrades," which if in a school where money is an issue, funding the design department is rarely going to be a priority.

Conclusion

The research has identified the importance of design and technology in education today, emphasising its relevance now more than ever. Design encompasses the practical application of science and maths principles; developing essential problem solving skills that are needed for our future's success. In order to return to a society that values makers and doers, as specified by Osbourne, design and

technology in education must not be neglected. Research has demonstrated how the subject is being affected in today's curriculum, identifying several valid and extensive points. When analysing the research, it seems both unfortunate and unfair that such an integral subject faces so many challenges. Despite agreeing with the points that have been raised and discussed, it is also necessary to consider the view that the education system is to blame. As discussed in the literature review, Dyson expressed this belief, accusing our education system of forcing students into their subject choices at such a young and feckless age. In his argument for schools killing creativity, Robinson is fundamentally suggesting a re-structure for our idea of intelligence, which should be rooted in our education system.

With students narrowing down their options to primarily four subjects by the age of sixteen, it is not surprising that design and technology becomes side-lined as explained in this article.

Recommendations for Future Work

However, there is reason to believe that this is not because of the subject itself, but rather more because of the system. It is absurd to think that at the age of sixteen, children are forced into such a decision that will dictate the rest of their life. Design and Technology is celebrated by those who understand the subject and realise the contribution it brings to society. A greater awareness of design is needed, in order to place the subject at the forefront of the curriculum. This shift in education should come about with the increasing urgency to re-address the system.

References

- [1]. Bernard, H.R. (2002). *Research Methods in Anthropology: Qualitative and Quantitative Methods*. Walnut Creek: AltaMira Press.
- [2]. Bibby, S. (2013). Staying Creative. *New Design*, 104(9), 44-45.
- [3]. Buckler, S. (2013, 3. January). *Design and Technology Curriculum is 'out of step' with needs of Modern Economy*. Retrieved from <http://govtoday.co.uk/>
- [4]. Chalabi, M. (2013, 14. March). A-level results 2013: The complete breakdown. Retrieved 21 January 2017 from <http://the-guardian.co.uk/>
- [5]. Data.org.uk. (2013, 7. March). Homepage. Retrieved 21 January 2017 from: <https://www.data.org.uk>
- [6]. Dyson, J. (1997). *Against the Odds: An Auto-biography*. London: Orion Business.
- [7]. Gov.uk. (2013, 8. July). *Education Reform: Schools - Written Statements to Parliament*. Retrieved 21 January 2017 from <https://www.gov.uk/government/speeches/>
- [8]. Gov.uk. (2014, 19. March). *Chancellor George Osborne's Budget 2014 speech – Speeches*. Retrieved 21. January 2017 from <https://www.gov.uk/government/speeches/>
- [9]. Lucas, B. & Claxton, G. (2010). *New Kinds of Smart*. Maidenhead, England: Open University Press.
- [10]. Ofield-Kerr, S. (2013, 17. June). Creative education: Is now the time for realism or optimism? Retrieved 21 January 2017 from <http://www.theguardian.com/culture-professionals-network/>
- [11]. O'flynn, P. (2012, 7. January). 'Made in Britain' must be restored as a Badge of Pride. Retrieved 21 January 2017 from: <http://www.express.co.uk/comment/columnists/>
- [12]. Petroski, H. (2013). *To Engineer is Human: The Role of Failure in Successful*. Design Vintage Books; 1st Vintage Books edition.
- [13]. Ratcliffe, R. (2013, 20. March). Drop in number of A-level students studying foreign languages. In *The Guardian News Paper*. Retrieved from: <http://www.theguardian.com/education/>.
- [14]. Robinson, K. (2001). *Out of Our Minds*. Oxford: Capstone.
- [15]. Robinson, K. (2006, 23. May). Ken Robinson: How schools kill creativity | Video on TED.com. Retrieved 21 January 2017 from https://www.ted.com/talks/ken_robinson_says_schools_kill_creativity.
- [16]. Robinson, K. (2013, 17. May). To encourage creativity, Mr Gove, you must first understand what it is. In *The Guardian*, 17 Retrieved 21 January 2017 from <https://www.theguardian.com/commentisfree/2013/may/17/to-encourage-creativity-mr-gove-understand>
- [17]. Seymour, R., Powell, D., Dyson, J., Callum, I. & Smith, P.

(2011, 21. June). *Listen to 'Creative Britain in Reverse?'* Retrieved 21 January 2017 from <http://blog.seymourpowell.com/2011/07/listen-to-creative-britain-in-reverse->

[18]. Strauss, A. & Corbin, J. (1998). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Thousand Oaks, CA: Sage Publications.

[19]. Stuart, H. (2012. 16. November). *Is Michael Gove*

Killing Creative Britain? Retrieved 21 January 2017 from <http://www.localschoolsnetwork.org.uk/2012/>

[20]. Studentladder.co.uk. (2013, 3. November). *Soft Subjects | Soft Subjects | GCSE*. Retrieved 21 January 2017 from: <http://www.studentladder.co.uk>

[21]. Wilson, T. (2012). *Thinking Ahead*. *New Design*, 1(99), 29-29.

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Gisli Thorsteinsson, is a Professor at Iceland University of Education, in the Department of Design and Craft Education. At present, he is also a Ph.D student at Loughborough University in England, where he is exploring the pedagogical values of using Virtual Reality Learning Environment for improving ideation in the context of Innovation Education in Iceland. Gisli was the Chairman of the "Association of Icelandic Design and Craft Teachers" from 1995-2005 and the chair of the NST "The Nordic Sloyd Association" from 2001-2004. From 2000-2004 he was on the Board of 'Nordfo', the "Nordic Research Association in Sloyd". 2001-2003 he coordinated the European project InnoEd and has been rewarded with numerous of grants from different sources for various educational activities. In 1999, he was involved in the National Curriculum development for Information Technology and Technology Education in Iceland and wrote the curriculum part for "Design and Craft Education". Gisli has written numerous articles on Design and Craft Education and the use of ICT and ODL in Education. He has also published several textbooks about Innovation Education.

