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Traditional Tales and Imaginary Contexts in Primary Design and Technology: A case study

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Abstract

Working with contexts is a key component to design and technology activity and education. The most recent iteration of the national curriculum programme of study for design and technology, in England, sets out that children between the ages of 5 and 7 "should work in a range of relevant contexts" (DfE, 2013, p.193); suggested contexts including "home and school, gardens and playgrounds, the local community, industry and the wider environment". Whilst these are real world and familiar contexts, fictional contexts also provide opportunities for developing "creative spaces" in which to speculate and discuss. This intrinsic case study explores the work of two primary teachers' development of a design and technology activity, where traditional tales provide the context. Children explore design problems and opportunities through the eyes of the *Billy Goats Gruff*, as they seek assistance to cross the river. Data was gathered through semi-structured interviews and document analysis of children's design work. The case study reveals how multidisciplinary and imaginative approaches to teaching and learning in the primary classroom stimulate and nurture design thinking, dialogue and critique.

Key words

creativity; design; primary design and technology; traditional tales; design fiction

Introduction

The national curriculum for design and technology (DfE, 2013), in England, states that pupils in key stage 1 (5 to 7 year olds) are expected to:

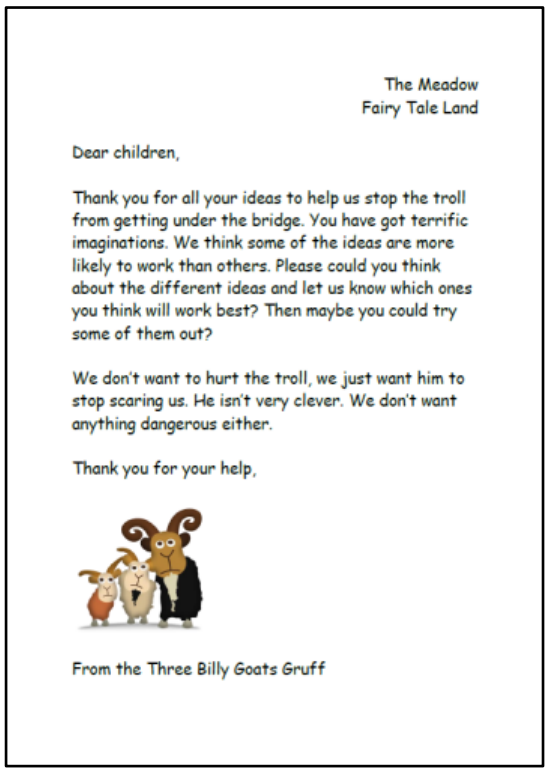
> "… be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making… [and] should work in a range of relevant contexts (or example, the home and school, gardens and playgrounds, the local community, industry and the wider environment)."

(DfE, 2013, p.2)

This study outlines a project with Year 1 (5 to 6 year old) pupils adopting an alternative approach to the realworld contexts suggested in the national curriculum programme of study. The project grew out of a discussion between the authors exploring novel approaches to teaching pupils about structures, which was considered to be a dry topic to teach. This perceived dryness may, in part, be due to the nature of structures and 'what works', along with the perceived need to focus on structural elements such as stability and reinforcement, or shell and frame structures; rather than creative application of knowledge.

As an alternative to frontloading teaching about technical structures at the beginning of the project, an approach was adopted in this study with the starting point being a context and the initial focus on developing imaginative solutions. In other words, the teaching and learning was frontloaded with contextual and design thinking, rather than technical knowledge. The emphasis was on designing and discursive activity, mediated by a traditional tale as the context, leading onto modelling.

The teachers considered that the previous year's structures unit of work was unimaginative, and a proposal was made to start with a design problem or context. The pupils had been working on traditional tales as a creative curriculum theme, and ultimately the story of the *Billy Goats Gruff* (Wikipedia, 2016) was chosen as the context for the project.



The Meadow
Fairy Tale Land

Dear children,

Thank you for all your ideas to help us stop the troll from getting under the bridge. You have got terrific imaginations. We think some of the ideas are more likely to work than others. Please could you think about the different ideas and let us know which ones you think will work best? Then maybe you could try some of them out?

We don't want to hurt the troll, we just want him to stop scaring us. He isn't very clever. We don't want anything dangerous either.

Thank you for your help,

From the Three Billy Goats Gruff

Figure 1

In the tradiational tale, three young goats attempt to cross the troll bridge to get to the grass on the other side. The first two, younger, goats persuade the troll that their older sibling will be more gratifying; and the third goat challenges the troll, knocking him into the river.

At the beginning of the unit, the teachers presented the pupils with a letter from the three goats, asking them to solve the problem of "the scary troll hiding under the bridge"; followed up by a second responding to the pupils' initial ideas (Figure 1). As the project progressed further letters were received from the goats, as clients, such as a letter explaining that a sign would not be effective(although inexpensive and straightforward), as suggested by one pupil, as the troll could not read.

Literature Review

The intention of this brief review of literature is to put this study in context and provide a rationale for the use of fictional contexts as a valid starting point for design thinking and activity.

In the opening chapter of 'Speculative Everything: Design, Fiction and Social Dreaming' Dunne and Raby (2014) challenge the notion that design is solely "about problem solving" (p.1) and highlighted issues with "[d]esign's inherent optimism", which can lead to an attempt to solve unsolvable problems, such as climate change. Although they acknowledge the important, and positive, role of optimism in design, they propose that some problems can only be addressed by changing "the ideas and attitudes inside our heads" (p.1). They call this *speculative design* – imagining how things might be. The aim of this speculative design is to facilitate and provoke discourse, rather than predict the future (pp.2-3). Fictional scenarios are used to encourage participants to "suspend their disbelief and allow their imaginations to wander" (p.3) rather than to focus on the future as an end in itself. Approaches include a range of philosophical tools, such as fictional worlds and cautionary tales.

Stables (1992), discussing the role of fantasy in design and technology activity, and how make believe comes naturally to children. This is related to the speculative nature of design in taking thinking from the concrete reality of "what is" to "what might be" (p.111). Stables goes on to caution that superficial handling of so called realworld contexts can resemble fantasy, providing an example of a rain forest. In this scenario, the context provides opportunity to empathise, although drawing on stereotypes somewhat limits the scope of designing, leading to a focus on technical rather than human concerns. The paper closes echoing Baynes (1986) of further investigation of designerly play.

Martin and Riggs (1999) noted that by the mid 1990s there had been a shift away from context in the Design and Technology national curriculum in England. Commenting on the emphasis on the product as opposed to values, reflecting an apparent narrowing of the interpretation and understanding of technology. The interim report for the Department of Education and Science and Welsh Office (1988), which preceded the launch of the national curriculum, commented on the purposefulness of design and technology activity, which differed from science education and "takes place within a context of specific constraints and depends upon value judgements" (p.4). However, Martin and Riggs suggest that more than a decade after its first teaching the role of contexts and values had somewhat diminished.

The current design and technology programme of study (DfE, 2013) reintroduced the idea of contexts for design, following its relative absence since the first orders in the 1990s (NCC, 1990). The

examples provided are real situations, such as "the home and school, gardens and playgrounds, the local community, industry and the wider environment" (DfE, 2013, p.2) in key stage 1. However, the Design and Technology Association's (D&TA) clickable framework, developed with the Expert Subject Advisory Group (ESAG) for design and technology, suggests that key stage 1 pupils could work in an imaginary context, such as "[t]raditional stories, fairy tales or nursery rhymes with a design problem to be solved [as] appropriate contexts for children's designing and making" (D&TA and ESAG, 2016, p.7). Hope and Parkinson (2011) and Bjurulf and Kilbrink (2012) have also written about the use of traditional tales in design and technology, and Antonopoulou (2011) about story-making, and the role of fiction in design. Although Dunne and Raby have "little interest" in what they call the "zone of fantasy", which go beyond speculation on possible futures that, whilst not scientifically proven, are conceivable (2014, p.4).

The relationship between science fiction and design has also been explored by Stirling (2005), de Vries (2007) and Antonopoulou (2011). The attribution of science in popular fiction could be argued to be more accurately understood as *technology*, considering Mitcham's (1994) ways of looking at technology as object, knowledge, activity and volition. Stirling talks about "design fiction" as being similar to science fiction, although to some extent it "sacrifices some sense of the miraculous"; on the other hand it lends itself to the "technosocial" (p.30). In a discourse on the nature of design and technology de Vries (2007, pp.21-27) explores how the imagined and future cultures of science fiction franchise Star Trek can be used to reflect on aspects of technology, including how technological artefacts are understood; as objects with physical and functional properties. Stirling and de Vries suggest an ability to consider problems through the eyes of another is a valuable tool for design thinking, which includes imagined, future and fictional worlds.

This case study describes how a fictional context, in the form of a traditional tale, was used to creatively introduce pupils to technical design and technology knowledge.

Research Design

This study is presented as an intrinsic case study (Stake, 1995) as practitioner enquiry (BERA/RSA, 2014). Case studies are a long-established method of documenting phenomena, across a range of disciplines, although there are associated difficulties and criticisms, including the wide variety of definitions (Flyvbjerg, 2011, p.302). Strengths of case studies as a technique to describe an in-depth "bounded system" (p.301) include developing an "understanding of context", generating new ideas or understanding and exploring relationships between phenomena (p.314). The choice of a 'case' involves "selection bias [which] may overstate or understate relationships" and the research may be unable to demonstrate statistical significance that larger scale statistical method can afford (p.314). However, the very nature of a case study, as an intensive analysis of developmental factors in relation to their environment, makes it an appropriate approach for developing conceptual understanding.

As sociomaterial research (Fenwick, Edwards and Sawchuk, 2011, pp.2-6), is concerned with conceptual (wants and needs of a client) and physical (modelling materials) artefacts as "cultural entities" (classroom dialogue, mediated by a traditional tale), taking the view that pupils and teachers engage with what Engeström calls an "object-orientedness of action" (2009, p.54); and that artefacts can be viewed as physical objects, knowledge or ideas (Wartofsky, 1979). The research

paradigm is qualitative and interpretive, adopting a relativist ontological perspective in terms of nature of realities for individuals, which are multiple, in relation to social and technological activity (McLain, 2012; Flyvbjerg, 2011; Guba, 1990; Guba, 1981).

Working within a social constructivist framework (Santino, Daniels & Gutiérrez 2009), the epistemological position is subjectivist, recognising the role of the researchers as a co-constructers of theory and knowledge with the actors (pupils) in the study. The approach to knowledge and experience is pragmatic and does not deny objective truth or reality, but acknowledges that we perceive and share conceptual constructs with physical and cultural artefacts, in this case traditional tale, mediating interactions in the classroom (Engeström, 2009, p.54).

The primary research method employed was a semi-structured interview with the lead teacher for the project. Kvale and Brinkmann describe qualitative interviews as a conversation with both structure and purpose (2009, p.3). Unlike normal everyday conversations, the interview is not an exchange between equal partners. The impact of "power asymmetry" (p.33-34) was addressed by adopting a collaborative approach, encouraging co-construction of knowledge through joint questioning and interpretation; informed by samples of pupils' and teachers' work for the project, as documentary evidence (Bowen, 2009; Wharton, 2006; Stake, 1995) of the activity undertaken in the classroom and evidence of the dialogue between teacher and pupil. These documents act as artefacts to facilitate and mediate interviews, in addition to providing and insight into the dialogue between teacher and pupil, for analysis and interpretation, as "social facts" (Atkinson and Coffey, 1997, cited in Bowen, 2009).

Findings

Description of context:

Prior to outlining the data gathered through document review and semi-structured interview, an outline of the context of this intrinsic case study will benefit the reader to allow them to envisage the operational context in which the study was carried out (Stake, 1995, p.64). The site of the study was a large primary school (2 form entry – approximately 60 per year), situated in the suburbs of a city in the North West of England, with pupils coming from mixed socioeconomic backgrounds, including historically working class families who have lived in the area for generations, families with young professional/middle class parents and non-nuclear family units. The school is comprised of separate infant (nursery to Year 2; age 4 to 7) and junior (Year 4 to 6; age 7 to 11) departments, sited in separate buildings across the school yard from each other; reflecting their previous existence as separate institutions.

The school has been described as fostering a culture of support and care, through leadership, teachers and teaching assistants; and that pupils' attitude to learning is described as outstanding (Ofsted, 2014). The curriculum includes a wide range of activities both within and outside of the classroom. The number of pupils receiving free school meals is above average, as is the number with identified special educational needs; although the proportion from minority ethnic backgrounds and with English as an additional language is below the national average. Overall the school was deemed to meet the expectations for pupils' attainment by the age of 11 (Year 6), at the end of Key Stage 2.

The case study is based on the work of the two Year 1 teachers with their classes in a 6-week unit of work, undertaken in January and February. The theme was chosen to align with a creative curriculum topic 'Once upon a time…' which facilitated cross curricular teaching.

Transcript of interview with the lead teacher:

Interviewer: "How did you come up with the idea for the project?"

Teacher: "The design brief arose following conversations between [colleague], [researcher] and myself."

Interviewer: "What were your aims?"

Teacher: "The initial aim was to promote the children's ability to generate solutions, without them feeling that they had to produce perfect drawings for each idea. We demonstrated this by our own rapid sketching."

Interviewer: "How did the learners respond?"

Teacher: "The children responded with great enthusiasm and imagination, generating a range of solutions, some more practical than others! Every child was able to successfully access the learning and generate some solutions; their developing writing skills were supported by teacher annotation, if necessary. We were struck by the conversations going on between the children, they listened to each other and developed and modified each other's ideas as they chose to work collaboratively. However, it was noticeable that, at this initial stage, no idea was immediately dismissed by the children. This meant that even less confident children suggested at least three solutions, without worrying if they were 'the right answer'."

Interviewer: "How did you manage the conversations that arose?"

Teacher: "Further letters from the goats refined the brief and closed the parameters, enabling teachers to stay in control of the solutions that could be safely and practically investigated. During each session the children reacted by great enthusiasm, recalling previous learning and predicting and explaining carefully and logically."

Interviewer: "How did the learners link the context with the subject content of structures?"

Teacher: "We saw more children choosing to use modelling kits during child initiated activities, including some who would not normally chose this area of continuous provision. The use of kits was also more focused, and, at one point, children competed to bridge the greatest gap, working together to make their structures stronger. Photos of different bridges and structures were available for the children to use as reference."

Interviewer: "Was there anything that emerged that was unexpected?"

Teacher: "The children introduced an ethical dimension into their investigations themselves. They made links to rivers bursting their banks and flooding, issues that some had seen on the news. They independently introduced their concerns for creatures living in the river, and suggested this as one of the success criteria for the final design."

Interviewer: "What impact did the project have on learners?"

Teacher: "The project was mentioned by some children when writing their review for the 'Child's Comment' section of their annual report, and has been repeated with a similar degree of enthusiasm and success in following years."

Document analysis:

Analysing the client brief and follow up letter (Figure 1) as a mediating artefact, using Engeström's (2009) human activity system, the subject could be considered to be the design problem and the object the design solution. The brief outlined the problem as including to "stop the troll from getting under the bridge", although the traditional Norwegian story of the *Billy Goats Gruff* outlines the imminent threat of being eaten! However, in this case, the goats set the children parameters (or rules), which included the instruction that the troll must not be harmed and primes them to be imaginative. The ethical dimension is played out through pupils' responses (see below) and the teacher-pupil dialogue. The community surrounding the activity has three dimensions: firstly, teachers through their planning; secondly the classroom where each teacher and their class engage with the task; thirdly, there is the wider community facilitated by the story itself and its cultural and historical influence. The brief also sets the task in the context of a pupil-led activity, with the teachers as facilitators (or mediators), which can be seen in both the annotations and feedback from the teachers (Figure 2 and Figure 3) and the teachers' reproductions of selected ideas (Figure 4). A sample of two pupils' work (Figure 2 and Figure 3) was selected by the lead teacher to exemplify pupil outcomes, illustrate the discussion between pupils and the teacher, and the aforementioned teacher facilitation.

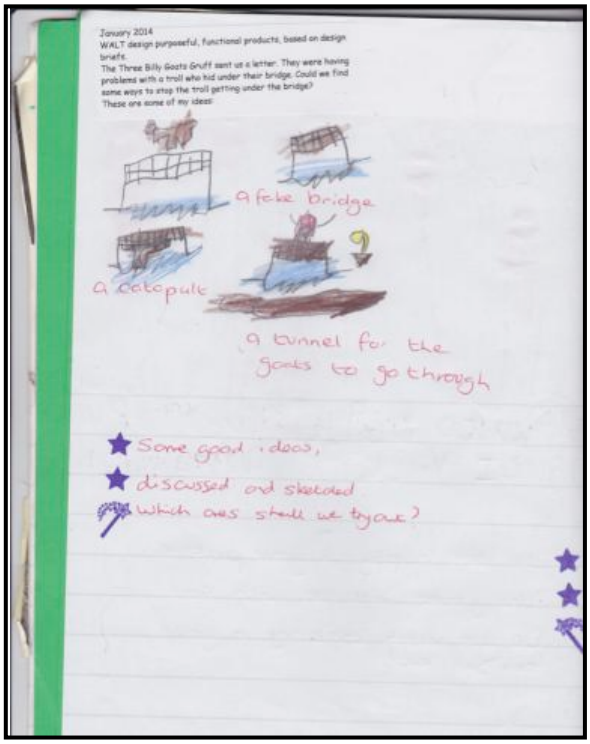


Figure 2

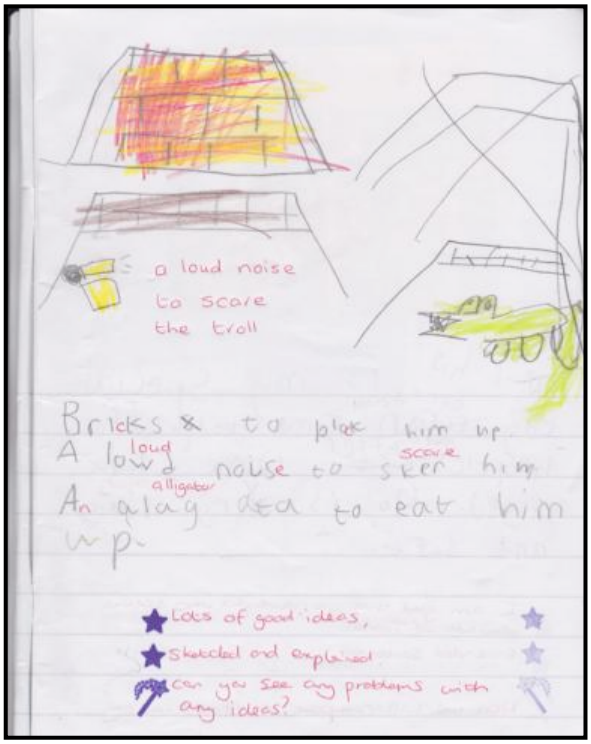


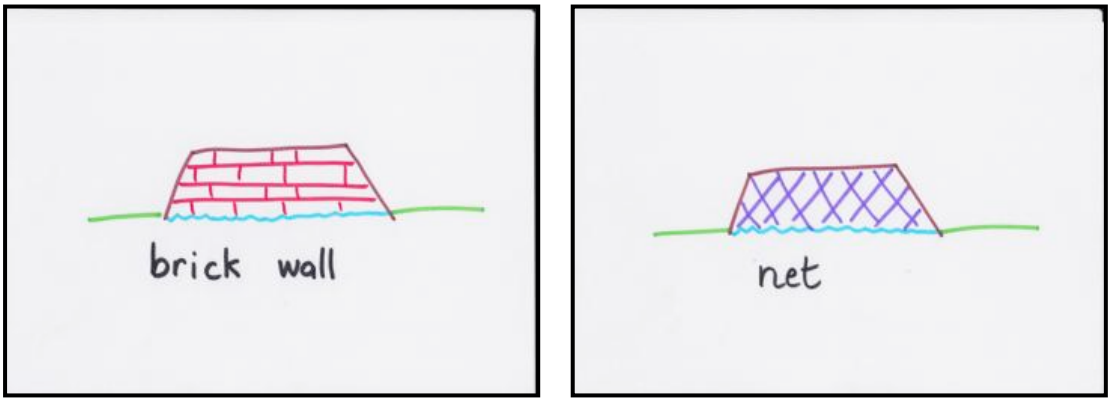
Figure 3

The lesson from which these documents originate involved the setting of the context, leading to teacher to pupil, pupil to pupil, and pupil to teacher dialogue. The teachers' discussed initial ideas with pupils, mediated by their sketches, with the teacher feedback and assessment including annotations, such as highlighting that the design solution could include "a fake bridge" to confuse the troll (Figure 2) or "a loud noise to scare the troll" (Figure 3).

Other ideas included a *flamethrower* and an *alligator* under the bridge (Figure 3), which prompted the second letter (Figure 1) and led to discussions about ethical and moral design solutions in a following lesson. Another pupil commented on the catapult idea (see Figure 2): "*You can use a catapult to make the troll go away and go to his mummy. He will go 'wa wa wa wa wa wa wa wa'. Or you can use a gigantic mouse trap.*"

After the lesson where pupils had worked on initial ideas, the teachers selected a number of ideas, representing the range of proposed solutions, to be discussed with the group in the following lesson. These ideas were then redrawn, by the teacher (Figure 4), and used as prompt cards. With the aid of these cards, the teachers modelled an iterative design process (DfE, 2013: 2) as a discursive activity with quality of ideas being the focus, rather than presentation.

The pupils went on to discuss practical and ethical implications of their ideas, identified other issues such as the impact of some of their early solutions on fish in the river, the wider environment and flooding (which was in the national news headlines at the time) – the idea to use a net (Figure 4) was to stop the trolls getting under the bridge, and allow the fish to pass through. The teachers reported that much of the work by the pupils was independent, at this stage in the process. The discourse around values revealed how the young learners' empathy and imagination provided a platform for them to critique the goats' needs and wants, considering different factors and perspectives.



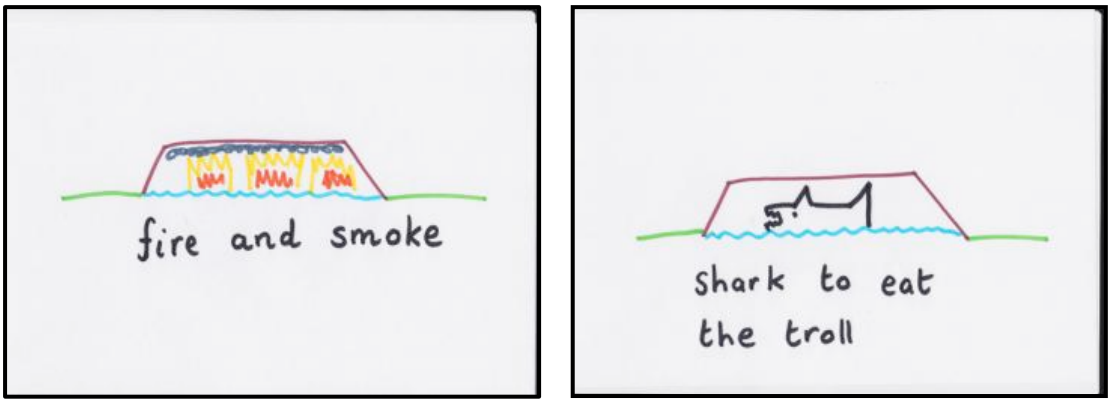


Figure 4

The opportunity for the children to use tablet computers to video themselves reflecting on their ideas supported this discussion and recording of design ideas, although this has not been evaluated as part of this study. Following on from the activity described above, the pupils used of construction kits, the Internet and large outside play equipment to further develop their technical knowledge and understanding of structures, as they explored “how [structures] can be made stronger, stiffer and more stable" (DfE, 2013).

Discussion

As described in the findings, the initial solutions included unfiltered and imaginative ideas that you might expect in a creative activity where judgement is postponed (Csikszentmihalyi, 1988). These ideas allow pupils to engage with a discourse and make value judgements, which the teachers acting as facilitators. In design and technology education, problem solving is a frequently used term to describe creative and design activity. Within psychological discourses around creativity, problem finding is also included as distinct, but “functionally interchangeable” (Csikszentmihalyi,1988, p.162) and assessable (Chand and Runco, 1993, p.156) process, but is not frequently referred to within design and technology (McLain, 2012). The open-ended dialogue between pupils, the story (context) and the teacher demonstrates both problem finding and problem solving.

Through the use of a fictional context, the pupils in this study were encouraged to focus on the social and affective aspects of the ‘problem’, rather than fixate on the practical aspects of bridge design or one initial idea (Nicholl and McLellan, 2007), which might have happened had the teachers frontloaded the teaching with technical knowledge of structures. This can be further articulated as enabling the the pupils to concentrate on the human (albeit anthropomorphised) needs and wants emerging from the task, not on the technical requirements to span the gap between once side of the river and the other, in the first instance.

Sequentially, the pupils progressed to modelling activities as their next stage of design, where they had the opportunity to learn and apply technical knowledge, but the introduction of this knowledge was staged, or scaffolded, by the teachers. As similar to the teaching method adopted in a study by Winn and Banks (2012) to teach 3D Computer Aided Design (CAD) concepts to 11-14 year olds, using an imaginary world context, where pupils drew castles and wizards rather than technical objects,

common to many CAD tutorials. An aim of this study was to encourage pupils to use "novel solutions to problems, to take risks and make links" (p.488), to focus on strategic rather than command knowledge (p.489). Winn and Banks' study differs in its methodology as some technical knowledge had to be imparted throughout the process in order for pupils to realise their ideas by using the software. However, both approaches are similar in that they privilege information about social aspects of a problem and control the introduction of, and focus on, technical knowledge; a principle that can be used to plan creative learning opportunities, as illustrated in Figure 5 (below) as a continuum for 'sociotechnical' issues (Petrina, 2003).

Figure 5

In this study the approach inverted the focus of sociotechnical learning activities, which appeared to defer or delay early decision making on practical and technical aspects of a solution.

> "… a creative person is able to delay closure: she avoids jumping to conclusions, and waits for the new idea to mature instead of forcing it prematurely into the shape of an already existing one." (Csikszentmihalyi, 1988, p.168)

Although Dunne and Raby (2014) do not favour fictional contexts within their conception of speculative design, the use of imaginary scenarios in design and technology has potential as a technique to address 'wicked problems' (Buchanan, 1995; Rittel and Weber,1974) through a dialogic approach to the subject. In recent years, there has been discussion within the design and technology community regarding the nature of design and technology activity, and this case study illustrates an approach to what has been described as a mainly designing or design without make approach (Barlex and Trebell, 2008; Barlex, 2005).

Conclusion

The approach adopted in this case study illustrates how imaginary and story-based contexts can provide suitable opportunities for key stage 1 pupils to work creativity as a means of solving problems in design and technology. This approach could be adapted as a platform from which to introduce pupils to potentially dry topics as a standalone activity or evolving into a modelling, a mainly designing or a design, make and evaluate activity. In essence, it challenges the notion that the starting point for a design and technology activity is knowledge of materials or systems, and presents a discursive and contextual approach. In this case the approach enabled pupils to initiate dialogue around ethical issues, under the guidance of their teachers, which gave rise to pupils making value judgements and considering wider contextual and contemporary issues which the teachers had not foreseen.

In addition to the role of the teacher to guide and facilitate child initiated learning, creating the environment for and sensitive interactions with pupils, the story of the Billy Goats Gruff plays a key mediating role in setting aside preconceived notions of teacher and pupil. Had a realworld scenario, as outlined in the national curriculum programme of study, have been adopted for this activity, the dialogue around the ethical implications may not have occurred as naturally – be it the impact of restricting of the flow of the river on the fish or the impact of a sign or a flamethrower on the trolls themselves. Both teacher and story play a crucial role in the activity, which created a memorable experience for pupils and teachers. This study illustrates how young children are capable of engaging with complex social and ethical issues with the support of the teacher to guide and direct dialogue emerging from the implementation of an innovative pedagogical practice.

The study celebrates, and highlights, how primary teachers, through their innovative use of pedagogical approaches, can challenge and develop design and technology education. At a time when the notion of contexts is receiving greater focus in design and technology in both the primary and secondary sectors. Colleagues working in education outside of the primary phase would be advised to consider this albeit under-researched, approach and consider implementing it in their own practice should it be deemed suitable.

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