Using Heritages and Practices of Wonder

to Design a Primary-School-Based Intervention

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Abstract

This study explores the multi-faceted phenomenon of wonder and its potential for educational experiences. In light of the literature and the lived experience of individuals, educationally desirable wonder can be characterized by positive affect, cognitive engagement, and exploration leading to information, connection, and continuation.

A proposed solution to the call for wonder, emerging from the experience and practice of a conjuror, envisioned the designing and running of a wonder-based invention in a school. The goals were to allow feelings of wonder, questioning, constructive activities, and the propagation of wonder to occur. The ultimate aim was to design materials that could be adopted and adapted by teachers without additional input from the researcher.

The thesis recounts how, informed by the practitioner action research of McNiff and Whitehead (2006), cycles of exploratory research led to the planning and development of an intervention, the Wonder Box system. With pursuits derived from the heritage of wonder, including cabinets of curiosities and object lessons, eight modules were designed using tenets derived during research. The intervention’s operation in a primary school, which saw participation growing from activities in a single class of 21 pupils to an event that involved the whole school, is described and evaluated. Follow-up work, involving the design of materials to be sent to teachers for their adaptation, is also described.

From the work carried out for this study, there are indications that educational experiences characterized by wonder and wondering can be designed for, and that the direct enquiry into wonder can yield a multitude of gains for participants, such as anticipation, curiosity, good humour, and celebration, with the identification and communication of interests across multiple disciplines. This study offers a number of concepts, reflections, and workable tenets, presenting a venture into a realm which deserves continued exploration.
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To the 1331 Collective.

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'The underlying purpose of magic in its many aspects is not to deceive people but to encourage them to approach life and the cosmos in a state of wonder.' (Sharpe 2003, p.183)

1 Chapter 1: Introductions

1.1 Wonder and the Practice of Conjuring

This dissertation grew from an initial proposal to study the potential benefits of conjuring for educational experiences. Conjuring is an art and craft designed to entertain through the demonstration of the impossible and surprising, achieved via multiple methods such as the manipulation of attention, the artful confounding of expectation, and the use of principles unknown to a ‘lay’ audience. Although a craft that relies on deception might appear to be in conflict with education, it has a history connected with pedagogy, imperfectly and only partially told (Marshall 1954; Schenk and Sondermeyer 1995; Kaye 2005).

It was during my years at primary school, with encouragement from my family, that my love of conjuring was fostered. Magic shows at school were an occasional treat, the star feature of a Summer Fête or a Christmas Show. These shows were given in the spirit of festivity but were also means to convey messages about road safety and the danger of strangers. I still recall the excitement and the feeling that the school had been transformed in its gathering together for spectacle and audience participation. Beyond festivities, on a regular school day, magic remained accessible to the neophyte, as both the classroom and school library held books that taught conjuring tricks step by step. I can recall the pleasure of learning topological tricks in the classroom library corner, and the rush of relief and satisfaction as I finally mastered a ‘move’ or understood a principle. I began my performance career in the playground, and recall the thrill of surprising my fellow pupils and hearing their expressions of disbelief and amusement. I was not the only child that performed magic. For a spell, we were a community of practice, swapping secrets and testing our execution. Clearly, in my experience, conjuring was a very positive and enriching practice.

As a teenager I regularly presented shows for younger children at birthday parties. I often found myself marvelling in the moment at the effect of some of the routines. Some of the most rewarding shows I put on were those where children were absorbed, elated, and eager to ask questions – where the performance of ‘magic’ led to collaborative inquiry
and theorising. I recall a number of instances where a traditional routine such as the baking of a magic cake resulted in an impromptu lesson on the science of cooking, led by children volunteering suggestions and conceptions. This for me was the real treasure: moments where the ‘audience’ were not distant spectators, but an assembly of ‘participants’, who were keen to get involved and to understand.

At the same time I felt increasing discomfort at the misinformation element of conjuring. Although an established part of the dramaturgy, I realised I had an issue with telling lies about the effects I was presenting. A Victorian trick, the Die Box, provides a good example. In this effect, a die vanishes from a cabinet and returns to the opera hat in which it was originally displayed. A traditional performance for children, such as the one I was presenting in my early shows, has the die become ‘invisible’ and ‘fly’ around the room to appear in the cabinet. Reflecting after a show, I realised that I was unhappy that a young participant could be left thinking that this was the way the Universe worked. So to overcome this disquiet, I reworked the presentation and came to demonstrate the apparatus as a piece of antique strangeness that allowed something to happen that really defied the laws of physics. Even though the method was not revealed, I took steps to ensure that children were clear that the impossible was achieved not by magic but by ingenuity and design. Over time, this led to me create programmes that sought to encourage participants to ask questions and suggest explanations and, because I wanted to ensure that some answers were forthcoming, to include effects with underlying principals which could be revealed, such as the topologies of knots, the surprising movements of rattlebacks and oloids, or the geometry of a ‘vanishing’ tessellation.

Thus I sought to remove ‘magic’ from my work, while wishing to retain and expand the sense of the ‘magical’. I visualised conjuring that would ‘open up’ the mind, assist participants to see things differently, revealing the unconsidered laws of the Universe and, with judicious selection, allow for mystery as tonic and stimulus. I felt far happier knowing that children would leave the party without misconceptions of how the world works, and, instead, with an appreciation of ingenuity of devices, or a sense of the application of physics or mathematics.

Conjuring remained close to my heart and, beyond my teenage years, I continued to explore the tradition. Parallel with my academic path, where I came to focus on the macabre in English Literature, I enjoyed researching into the history of conjuring and the allied arts, such as puppetry and optical illusions, and continued to design apparatus for
both my own use and for other practitioners. My performances evolved into occasional ‘Happenings’, where I remained keen to use the opportunities to communicate ideas and confer a sense of the magical, while casting participants into scenarios involving challenges via mechanical puzzles, riddles, and adventure scenarios.

My life took a change of course when I saw an advertisement offering scholarships for ‘playful and game-based learning’ at the Learning Sciences Institute at the University of Nottingham. I submitted a proposal to investigate the use of conjuring, puzzles, and games as tools for learning – and had the good fortune to be invited for interview.

At the interview my two supervisors-to-be, Professor Mike Sharples and Dr Shaaron Ainsworth, considered the ‘dark side’ of conjuring. Following my acceptance of the offer to join the LSRI, as an initial exercise I drew up a list of what Ainsworth called ‘Bad Magic’. We agreed that Bad Magic performed is egotistical, confusing, irrelevant, discomforting, and leads to misconceptions. ‘Good Magic’, on the other hand, opens up the way to questioning, exploration, and new information and understanding. This distinction proved to be an invaluable prompt to my initial explorations.

1.2 Working with Wonder

It was the pursuit of Good Magic that led to the realm of Wonder. Within days of commencing research, I was immersed in conjuring books, seeking to create a taxonomy of conjuring effects or ‘magic tricks’ that had methods derived from scientific principles. This, I felt, was a good starting point – to produce an inventory of demonstrations which could be employed both to entertain and enlighten. Sir David Brewster, inventor of the kaleidoscope, had observed in a letter to Sir Walter Scott ‘...we have sufficient evidence that almost every branch of knowledge had contributed its wonders to the magician’s budget...’ (Brewster 1832, pp. 8-9); here the model was being reversed and the ‘magician’s budget’ or bag of tricks was being turned inside out as a potential contribution to knowledge, resulting in what I envisaged would be a resource for educators. In the dark but pleasant confines of a private library I reflected on the introduction to Arthur Good’s Magical Experiments or Science in Play (1894):

‘For the experiments here displayed are not only entertaining, but instructive; not only amusing, but surprising; not only attractive to the young man and the maiden, but to the old man and the matron. By means of the simplest and commonest objects, always at hand, the reader can illustrate some of the most wonderful things in science, and convey
valuable instructions... To the teacher who wishes to create in his scholars an interest in science, no book can be of greater assistance. It will enable him practically to illustrate and enforce scientific principles, and render his instructions as interesting as an Arabian tale.’ (Waters 1894, p.7).

Here was an upbeat, pragmatic, democratic vision that read like a manifesto for ‘Good Magic’ (written, appropriately, to introduce a volume compiled by ‘Good’). What particularly caught my attention, however, was the fact that someone had ringed the phrase ‘wonderful things’ in pencil. It occurred to me that this was the mantra for my current (re)search: ‘things’ that were concrete and could be handed over to others to examine and use; things that were ‘full’ of the potential for ‘wonder’.

On one hand, as this thesis demonstrates, there is a wealth of literatures and artefacts that attest to the positive qualities of wonder in an educational context. On the other hand, at a practical level, there is no clear guideline or set of materials available to teachers to help them work with wonder. This study aims to bridge this gap, considering diverse ways of working with wonder by connecting ideas from multiple disciplines and a wide sample of the living, exploring the propagation of an intervention, and recounting the journey for the use of others.

1.3 Research Questions

Two connected research questions have shaped this study:

- What is ‘wonder”? i.e. How it is delineated in literatures? What is its heritage? How is it popularly understood?
- How can we mobilize the heritage of wonder and the insights of the living for the design of wondrous experiences in school settings?

These questions came to influence the study at every stage, from the ongoing search of literatures, to the exploratory research, to the design and (re-)consideration of potential devices for educational wonder.

1.4 Towards a Description of Wonder

In this thesis, wonder is seen as an experience that moves from anticipation through to an encounter which allows and encourages investigation, discovery, sharing, and propagation. Wonder is characterised by positive affect, questioning, and the motivation to find out. It is elicited by qualities such as novelty, mystery, and surprise. It should be
differentiated from the phenomena of amazement, admiration, astonishment, and awe, which are seen to be blocks to exploration, discovery, or understanding. Wonder is considered as something that can be designed for. The rationale behind these statements can be found in Chapters Two and Four.

1.5 Major Aim of the Study

The major aim of this study has been to provide useful solutions to the puzzle of how wonder might be worked with beneficially in schools by both teachers and pupils.

It seeks to provide a helpful description of the phenomenon by looking for clues in etymology, history, and in the lived experience of people. A consideration of the important features of the phenomenon in relation to educational experiences is presented, and design tenets to help realise these features are suggested.

The study details the production of inventions, experiences, and interventions which have wonder and learning at their heart and considers how they could be further developed for others to learn with and to learn from.

1.6 Outline of the Thesis

Chapter Two considers the history of ideas associated with wonder, focussing on the main themes that relate to educational settings. Instances where wonder and learning have been designed for are considered. The account posits a heritage of wonder which includes traditions not associated with formal schooling (the art and craft of conjuring, the tradition of the Wunderkammern or Cabinet of Curiosities, the Labyrinth) to classroom practices (the Object Lesson of Pestalozzi, the Nature Table, and the direct enquiry into wonder as a topic). The chapter concludes with examples drawn from government documents for standards in education which express that wonder is a requirement in formal schooling.

Chapter Three describes the methodology used in the study, an interpretation of practitioner action research suggested by McNiff (2003) and McNiff and Whitehead (2006). McNiff’s vision of educational research as ‘grounded in a special kind of philosophical wonder that has the potential to transform into considered action’ (McNiff 2003, p.4) suggested a methodology sympathetic to the theme of wonder itself. Furthermore, McNiff and Whitehead’s characterisation of the action researcher as a responsible, influencing, creative, and opportunistic agent suggested parallels with the socially engaged conjuror or ‘wonder worker’.
Chapter Four is an account of the exploratory research which inspired and informed the main intervention. The reconnaissance begins with the collection of conceptions of wonder from academics and conjurors, before moving to the streets to gain a wider sense of wonder as a lived experience. The cycles include instances of interactive events designed to present and share instances of the wondrous. Each of the exploratory projects is described according to accepted phases of action research: planning, acting, observation, and reflecting.

Chapter Five describes the Wonder Box system, a modular set of wonder-centred pursuits designed to be operated in a school. The chapter traces the design and the development of the intervention, with its inspiration from both the heritage and people’s lived experience of wonder, and the goals that shaped its realisation. Its running in a primary school classroom with, in the first instance, a teacher and 21 pupils, growing to include the contributions of the year group (approximately 70 pupils) and the participation of the whole school, is recounted.

Chapter Six describes the planning, production and reflections on two iterations of the Wonder Box system: a personalised written briefing (the ‘Quick Start Guide’ and the ‘Fool’s Guide’ to the Wonder Boxes) which was sent to a science teacher in a secondary school in Canada, and an illustrated booklet, ‘The Wonder Box System’ which was sent to a primary school teacher in Cheshire.

Chapter Seven looks back at the work, considers its uses and its shortcomings, describes ongoing practice, and posits ways forward for educational wonderment.
Chapter 2: Wonder and Its Heritage

2.1 Introduction

This chapter surveys the field of wonder and considers how the phenomenon is commonly conceived of, asking how it can have an important bearing on lived experience, particularly educational experiences, and how it might be worked with usefully in schools. Distinct themes about the nature of wonder emerge from a necessarily diverse range of literatures, providing a conceptual framework which orientates the study. This framework is expanded by a practitioner’s view of the heritage of wonder as delineated in the sympathetic traditions described here. Connections between the traditions are considered, and their alignment and resonance with creative pedagogical practice is highlighted. After considering the parlous relationship of ‘awe and wonder’ with recent and current schooling expectations, a case is made for the continued open and reflective exploration of the value and potential of wonder in (and beyond) formal education. One suggested route, introduced here and explored in the study that follows, is via the design of educational inventions which operationalise and explore the heritage of wonder with informed, kind, reflective and reflexive practice.

Two questions structure this chapter and motivate the research to come:

1. What is ‘wonder’? i.e. How it is delineated in literatures? How is it popularly understood?
2. How can we mobilize the heritage of wonder and the insights of the living for the design of wondrous experiences in school settings?

These routes begin to be explored in this chapter. The question of how wonder is popularly understood is one of the subjects of Chapter Four: at the time this dissertation was written, compendia of contemporary popular accounts of wonder were, with one exception, uncommon (Violette and Withers, 2007).

2.2 What is ‘Wonder’?

It is puzzling that there have been no grand anatomies of the topic of wonder. Nevertheless, it is a perennial subject of interest. Recent histories (e.g. Daston and Park 1998), design studies (Gage 2006) and the classroom research of Tomkins and Tunnicliffe (2007) suggest that there is a growing interest in the history, nature, design, and benefits of the phenomenon. For now, the literatures are disparate and have yet to be collated.
With this in mind, this thesis aims to provide an array of themes which adumbrate and afford a grander vision of wonder work.

Although the texts considered here feel like authentic responses to the lived experience of wonder, it was my concern to reach into the unwritten, lived-in world and to talk to and work with people. Thus from a very early stage of research, I found myself having many conversations about wonder and interactions in the spirit of wonder with a wide range of individuals. It seemed befitting to the heritage, in particular the Direct Enquiry (see below), and struck me as good and potentially fruitful practice, both as an educational researcher and a practitioner interested in the evocation of wonder. Furthermore, it balanced out what supervisor Ainsworth conspued as ‘the wisdom of the dead’. These conversations and interactions are the subject of Chapter Four.

2.2.1 The Etymological Roots of Wonder

Although it is not conventional to situate research in the Learning Sciences in etymology, here the roots of the word are consulted for initial illumination. These roots preserve several important concepts which offer grounding for the work that follows.

What are the key qualities of wonder as suggested by etymology? At least five themes emerge. Wonder has been identified with:

1. **Portents** (Old English, Frisian wundor)
2. **Delight** (German, Wunne (Partridge 1966))
3. **Desire** (Medieval German Wunder, traced back to the Indo-European uen, Bynum 1997)
4. **Wandering** (Old English wendan, from which the word ‘wend’ also derives)
5. **Wounding** (Old English wundor (Parsons 1969)).

So a survey of the ‘fossil record’ of etymology suggests that the experience of wonder is associated with omens and perceived significance (‘signs and wonders’, auspices); with positive affect, interest and curiosity (delight and desire); with movement or exploration (wandering); and, perhaps most surprising, with wounding.

The themes from the etymologies will be pursued in the work that follows, but the last association is worth considering ahead of this. The ‘beneficial wound’ is a concept that has helped shape my thinking as a practitioner. I have come to see the idea of a ‘wound’ as recognition of what conjuring and related arts can do to a spectator or participant, for good and for bad. By wound, I think of a cut that changes a person’s relation to the world.
A wondrous demonstration has the potential to disrupt and disconnect, to strike a blow, to drive a wedge between expectation and experience. This wound need not be mortal or morbid; in my practice I see it as a way of allowing ‘the light in’, potentially conferring upon a participant a power of appreciation and insight (along with the other potential positives considered in this study), and, for the ‘wounder’, always informed by an awareness of the negatives and potential pitfalls (see, for example, the issue of related phenomena such as astonishment and awe, below). The most important point to make at this stage, and an imperative throughout, is the need for an ethically informed and caring practice: wonder in practice is predicated on kindness. Kindness has been one of my mantras for both practice and research, and it has proven both stimulating guide to thinking and acting. It will be considered further in Chapter Three.

2.2.2 How is Wonder Delineated in the Literatures?

The pursuit of wonder allows for the inquisitive and acquisitive traversal of many fields. The debates, manifestations, and paeans span an aeon, embodied in examples of Classical, Renaissance, Romantic, and Post-Modern texts. Wonder has been addressed from the disciplines of psychology (McDougall 1909), literature (Quinn 2002), history (Daston and Park 1998), philosophy (Hepburn 1984), religion (Fuller 2006) and aesthetics (Fisher 1998). Wonder has been conceptualized as an emotion (McDougall 1909; Frijda 1986), a sense (Carson 1956), an attitude (Greenleaf 1967), a disposition (Verhoeven 1972), an element (Silverman 1989), a state (Opdal 2001), and a feeling (Bantjes 2010).

Across the literatures, six themes stand out as important. These conceived characteristics of wonder help both in the understanding of the lived phenomenon, particularly with an eye on their educational benefits, and offer orientation in the design and the harnessing of wonderment.

Above this stands a shared observation about wonder which also helps its design and harnessing for experiences. This is the observation, identified in the literatures that are identified in the next section, that wonder is multi-phased: in the experiences of people it has the potential to move from one stage to another. These phases can be labelled: arrest; exploration; and revelation.

2.2.2.1 Phases

Befitting a protean phenomenon, commentators from Plato onwards have discerned different phases within the experience of wonder. Each of these phases, summarized in
this section, are topics of debate in the literature. As this section delineates, these are generally held to be:

- A moment or moments of arrest
- A phase of exploration
- A moment or moments of revelation

It should be added that this can only be a partial list, a mesh of collected recorded conceptions. That people’s experiences of wonder are both vast and subtle is evinced by the exploratory research that follows, for example. Lived experiences of wonder, collected during interviews in parallel with the search for the literatures, proved essential to the understanding and mobilizing of the phases first laid out in the literature. In addition, interviews helped identify another phase: **anticipation.** This expanded structure of phases proved a useful insight for the design and instantiation of a wonder invention, and will be described in Chapter Four.

**Arrest:** The phrase ‘wonderstruck’ has come to describe the moment of encounter with the wondrous. Albertus Magnus describes this as ‘the flight of the heart in systole’ (Daston and Park 1998, p113). It is elicited by an encounter with an object, artefact, or situation (see section 2.2.3.3) which causes the subject to stop and pay attention. The moment of arrest is generally caused by or accompanied by a sense of significance as the subject construes that there is more to know. This significance can be triggered by a number of aspects or dimensions, as described below and explored in Chapters Four and Five. Quinn (2002) considers wonder ‘the passion that arises from consciousness of ignorance.’ (p.11); Opdal (2001) expands this to ‘an experience or state of mind signifying that something that so far has been taken for granted is incomplete or mistaken.’ (p. 342). This is where the etymological connection with ‘wound’ can again be evoked: the moment of unknowing opens a gap between the subject and the world, resulting in a potentially beneficial disconnection that can be made good in ensuing phases. This moment of arrest is profoundly important to the designer and pedagogue: it is the moment when the experience of wonder takes on its shape, a touchstone from which the sequences that follow develop.

**Exploration:** An authentic experience of wonder, as opposed to experiences that metamorphose into astonishment or amazement (see ‘Knowledge’, below 2.2.3.1), has the potential to lead onwards to a phase of exploration. This is associated with the arousal of curiosity and interest (Smith 1776/1999; McDougall 1909; Kashdan and Silvia 2009). It is
also suggestive of the etymological connection with the Old English *wendan*: exploration encourages wandering. This exploration is undertaken optimistically, with an ‘expectancy of fulfilment’ (Cobb 1977, p28).

**Revelation:** Finally, and with particular significance for educational experiences, as discussed below, an experience of wonder can lead to positive transformation in the allowing of new information, insight or understanding in its participants. Parsons (1969) describes this as the moment when a ‘new pattern suddenly ingresses and ... hitherto conflicting patterns ‘click’ into place’ (p.91). The ‘Aha’ or Eureka moment (Auble, Franks, & Soraci, 1979), or moments of clarity, appreciation, and creative increase may be the outcome of a moment of wonder in revelation phase (Keen 1969). Fisher (1998) writes: ‘The tie between wonder and learning is clear in the moment when after long confusion and study you suddenly say, ‘Now I get it!’ (p.21).

Although not all phases are discussed by all commentators, this conflation provides a rudimentary map of the conceived terrain of wondrous experiences. As mentioned above, in the light of material that emerged during exploratory research, it was justifiably viewed as a working model, requiring and subject to testing and iteration. It helped to orient the research and design, providing, for example, a structure for the interventions. The use of structuring ideas such as phases and aspects of wonder will be further explored in the account of the exploratory research, the design, and the study.

### 2.2.3 Themes

Beyond the observed and reported phase structure of wonder experiences, there are five key themes that can be identified in the literatures. These themes have informed and guided my practice and this study. They provide a working taxonomy of the characteristics of wonder which assists both in appreciation and design:

- **Knowledge:** Wonder has important epistemological reach
- **Positivity:** Wonder is characterized by positive affect
- **Manifestation:** Wonder is frequently elicited by encounters with the material: things and situations with perceptible qualities such as novelty, mystery, and surprise
- **Impermanence:** Wonder is ephemeral
- **Propagation:** Wonder grows.
2.2.3.1 Knowledge

There is an ancient and venerable tradition of thought concerning the nature of wonder which appears to begin with Plato. In *Theaetetus* (154b-155c) Plato has Socrates state that wonder is the source of natural philosophy (i.e. knowledge in general). This idea is taken up by Aristotle:

‘It is through wonder that humans now begin and originally began to philosophize; wondering in the first place at obvious perplexities, and then by gradual progression at the greater matters too, e.g. about the changes of the moon and of the sun, about the stars and about the origin of the universe.’ (*Metaphysics* I.i.982b11-24.)

This idea of wonder as genesis continued to be cited and explored by philosophers including Descartes (1649), Hegel (1837), Kierkegaard (1845), and Heidegger (1937-1938). Whitehead (1938/1968) extended the potential reach of wonder from alpha to omega and marked it in its high estimation:

‘Philosophy begins in wonder. And, at the end, when philosophic thought has done its best, the wonder remains’ (p.168).

The exploratory phase described above is clearly important to this conception of wonder. Although the challenge, the ‘wound’, may initially disrupt, the exploration which is allowed after the inciting moment is associated with pleasure and intrigue. ‘It leads us forward, inviting us to discover more’ (Fuller, 2006, p.156). The ‘unknowing’ is not experienced ultimately as a deficit but as a pleasure (Cobb 1977. C.f. Positivity, 2.2.3.2). Furthermore, it is associated with the development of skills and cognitive strengths (Fuller, 2006).

The crux for wonder and educational experiences is how far the exploration is allowed or able to extend, and the vision of what might be acquired in the search. Provided exploration is possible, there remains the possibility of new understanding and appreciation, be this an experience, information, or a connection. Here there is the possibility of positive revelation, as mentioned in the outline of phases, above. The ‘aha’ or eureka moment could be one positive arising, for example. However, in contrast to the idea of revelation, there is the possibility that wondering might not provide any answers. There is a potentially ‘dark’ side to this, which is considered below. The upside of mystery, however, is its potential motivational power – an appreciative orientation to the unknown. There is the view that mystery could prove tonic in a society that is
characterised (and damaged) by the illusion of certainty: ‘Perhaps that’s why mystery, now more than ever, has a special meaning. Because it’s the anomaly, the glaring affirmation that the Age of Immediacy has a meaningful downside. Mystery demands that you stop and consider—or, at the very least, slow down and discover.’ (Abrams 2009, p.81). Perhaps the engineering of mystery associated with wonder could be an essential tonic; if the not-knowing is engaged with consciously and appreciatively, perhaps even taken as far as being celebrated, the experience might prove enriching and educational. For Duckworth (2006), ‘The virtues involved in not knowing are the ones that really count in the long run.’ (p.67).

The ‘dark’ side of wonder is not necessarily ultimately negative or without merit.

A number of concepts help make some nice distinctions between wonder and what happens if it is blocked or pushed, these concepts being: astonishment; amazement; admiration; and awe. These concepts are all connected in what they deny: the possibility of gaining insight and understanding.

With etymological roots in the idea of being turned to stone, **astonishment** can be seen as a state of arrest that results in an inability to act further. Descartes wrote that astonishment ‘makes the whole body remain immobile like a statue, such that one cannot perceive any more of the object beyond the first face presented, and therefore cannot acquire any more particular knowledge.’ (*The Passions*, cited in Daston and Park 1998, p.317). The experience may be pleasurable, but it does not allow for exploration, expansion, or acquisition.

Like astonishment, with its block to exploration, **amazement**, connected to the word ‘maze’, offers a journey which is ultimately blockaded from the possibility of discovery. The maze referenced here is a trap that offers multiple pathways that are designed to prevent escape or, in this case, the liberation of understanding. Mazes are a popular cultural construct (e.g. Fisher and Saward, 1991). A wander through a maze need not be an unpleasant experience. Mazes afford the exploration of space, orientation, observation, and problem solving, for example. The concern here is the epistemological maze: there is a difference between an informed choice for getting and being lost (a magic show, a hall of mirrors) from which beneficial insight and reflection could arise, and being snared by our unknowing.
Although the word **admiration** derives from *mirari*, the Latin for wonder, commentators have sought to make a distinction between wonder and admiration (e.g. Smith 1795/1980). McDougall (1909) identifies admiration as a fusion of wonder and negative self-feeling’ (p.302), with the negativity being expressed as passivity, which in turn blocks exploration. The concept has not been pursued in recent psychology and the word has become muddied by its positive contemporary associations. As a distinction it is helpful in informing practice, particularly as a reminder of the need for practices and structures which allow and encourage, and which are watchful for ‘negative self-feeling’.

Finally **awe**, although linked with wonder in the phrase ‘Awe and Wonder’ (Ofsted, 1993), is conceived of as qualitatively different to wonder, or at least different by degree. It can be linked to the Romantic imagining of the Sublime (Burke 1756/1958). Keltner and Haidt (2003) situate awe in the ‘upper reaches of pleasure and on the boundary of fear’ (297), arising from appraisals of vastness and inexplicability. For MacDougall (1909), awe is a ‘tertiary compound of fear, wonder, and negative self-feeling’ (p.305).

There is another clue in etymology – ‘awe’ derives from *agan*, the Old Norse word for ‘fear’. From the interviews that I conducted as part of the exploratory research, I came to see ‘wonder’ and ‘awe’ as a spectrum, with awe being identifiable with the far reaches of a wonder experience. Although experiences of awe are unquestionably important, if not life-changing, my approach as a practitioner and researcher was to work to design for wonder in the first instance, with the hope that some experiences would approach awe via unforced unfolding of wondrous occurrences (Fuller 2006).

Continuing the theme of knowledge, it is important also to address the idea of misconception. This, as I have mentioned, has been a watch word and motivator in my practice, ever since I realised the power of conjuring to confer an educational experience. It has resulted in my being cautious at the use of both language and the structuring of experiences. I do not want a witness to a conjuring effect taking away the wrong idea of how the world appears to work; the magic must happen, in part, through an awareness of impossibility for the participant. The responsibilities of conjuring are considered later in this chapter.

Another perceived weakness that cautions against an uncritical approach to wonder concerns the potential pitfalls that arise between the initial moments of wonder and the exploration that ensues. Bacon (1605/1915), in the same work in which he conceived of wonder as ‘the seed of knowledge’, conceived of wonder as ‘broken knowledge’ (p.7).
Here there is a warning against the failure to connect in our understanding, design, and practice. Without the opportunity to go beyond the experience, there is a risk of incomplete understanding or misconception.

There is a clear requirement: wonder in education, if designed for, should be scaffolded or assisted to help avoid ‘brokenness’ and should be engineered for the making of beneficial connections. In practice this means that instantiations of wonder need to move beyond the initial moment of arrest, to the possibility of explorations connecting to new information, understanding, and appreciation. I suggest that here the multiplicity of potential wonders is a boon; some incidents can lead to an increase in knowledge, others can be seen as a celebration of not-knowing. Accordingly, this study maintains a keen connection with the ideas of mystery and revelation.

2.2.3.2 Positivity

There is a consensus that an experience of wonder is predominantly affectively positive. Daston and Park (1998) cite Avicenna, who associated wonder with pleasure and laughter (p. 112); McDougall (1909, p.257) and Izard and Ackermann (2000: p.62) associate wonder with joy, Fisher (1998) with ‘delight’ (p.55). Midgley (1989) states positively if gnomically that ‘wonder involves love’ (p.41). Wonder has a wide hedonic and eudaemonic range (Kringelbach and Berridge, 2010). An etymological insight traces the word ‘wonder’ to the word ‘smile’, via the idea that the Latin word for wonder, mirari, derives the Indo-European root mira, ‘smile’ (Bynum 1997, p.7).

Wonder, if not an emotion, is at the very least, emotionally involved. Clearly there is a significant relational boon, which extends beyond immediate pleasure to elected ethical practice. Hepburn (1984) writes of wonder’s ‘ethical affinities’: ‘Considerations... can be brought in favour of fostering the attitude and experience of wonder. They arise from the life-enhancing character of wonder, appreciative and open, opposed to the self-protective and consolatory.’ (p.144). Hepburn adds that wonder is ‘other-acknowledging’, with the potential to generate ‘respect’, ‘compassion’ ‘gentleness’, and ‘humility’ (pp. 144-146). Greenleaf (1967) establishes this, writing from a point of view where the great positivity of wonder is its leveling quality, from which much can arise: ‘to wonder is humbling, it opens one to learn’ (p.108).
2.2.3.3 Manifestation

Just as the act of wondering finds life in reflection and imagination (e.g. Keen 1969; Hepburn 1984), it becomes clear from accounts from Plato onwards that the stimulus for wondering or felt wonder is often an encounter with a wondrous entity (or a wonderful ‘thing’). This has been evoked in the model of the phases of wonder described above, where arrest upon the encounter with an object, artefact, or situation is key. Objects (naturally occurring materials) and artefacts (constructed materials) that have caused people to wonder encompass a set of entities as diverse as rainbows (Fisher 1998), nematode worms (Midgley 1989), and automata (Godwin 2009). The perceived qualities of these causes of wonder are varied. Fisher (1998) uses the word ‘extraordinary’ (p.55). Fuller (2006) lists qualities such as novelty, unexpectedness and ‘especially those things that strike us as especially powerful, real, true, and/or beautiful.’ (p.33). Keen (1969) considers ‘contingency’, ‘mystery’, and ‘presence’ to be ‘formal characteristics’ common to all objects of wonder (p.24). Midgley (1989) believes that an ‘essential element’ in wonder is the recognition of ‘otherness’: ‘something we did not make, cannot fully understand, and acknowledge as containing something greater than ourselves’ (p.41). As considered previously, this is a perception of the inexplicable and vast that, for some commentators, is the domain of awe (Keltner and Haidt, 2003). Clearly, there are many characteristics discernible in wondrous things and multiple vantages. Working critically with taxonomies is one way of ensuring engagement with meaning and reflective and reflexive practice. Furthermore, these perceptible qualities open the way to effective design.

2.2.3.4 Impermanence

In nice distinction to the claim that wonder is generative is the conception that wonder is ephemeral. Phrases such as ‘nine-day wonder’, ‘three-minute wonder’, or ‘one-hit wonder’ attest to this. Keen (1969) writes of the ‘eclipse’ of wonder, while Quinn (1969) writes of its ‘wane’; Hepburn (1984) considers its ‘displacement’, and Fisher its ‘decay’ (1998). The argument of impermanence is a useful caution in the design of experiences, and an important orienting idea.

What are believed to be the ‘enemies’ of wonder, the factors that are claimed to underlie its fleeting nature? A historical perspective holds that shifts in attitudes to knowledge, particularly connected to religious belief and social hierarchies (Daston and Park (1998) and Quinn (2002)) are responsible. A philosophical perspective sees wonder being
displaced by understanding (e.g. Keen 1969) and a sociological perspective might argue that stress has a major role to play (e.g. Dunlap and Kellert 2012). None of these stances are necessarily terminal. Historical perspectives are constructions of the past and do not reflect the future, though they provide cautionary tales of the powers of ideology; philosophy offers arguments that can be countered by other philosophies (Whitehead 1932); and stresses such as ‘economic pressures, professional disappointments, ill health, and family conflicts’ although undoubtedly able to ‘drain the wonder from our quotidian existence’ (Dunlap and Kellert 2012, p.3) are also subject to decline and open to remedy (Cohn and Fredrickson 2009).

2.2.3.5 Propagation

For Francis Bacon in The Advancement of Learning (1605/1915) wonder is famously ‘the seed of knowledge’ (p.6). This metaphor befits a phenomenon associated with potential growth, fruition, and transformation for those who experience it (Carson 1956, Hepburn 1984). The traditions that are introduced below as the heritage of wonder are expansions of wonder and wondering across known civilizations and time, and, it can be argued, are the both the fruit and the seeds of more than knowledge.

2.2.4 The Call for Wonder in Schools

Given the positive attributes of wonder as identified above, it comes as no surprise that wonder is evoked in the UK educational system. Wonder is referenced several times within current government standards for education. Within the primary curriculum (Key Stages 1 and 2) it can be found in a statement of values that addresses the environment: ‘(O)ur environment... the basis of life and a source of wonder and inspiration that needs to be protected’ (DfEE/QCA 2011).

Wonder is also referred to in the National Curriculum Primary Handbook (DfEE/QCA 2010) under the programme of learning which addresses scientific and technological understanding:

‘Children live in an age of fast-moving science and design and technology. This area of learning is fundamental to exploring, understanding and influencing the natural and made worlds in which we live. It offers a wealth of experiences and ideas that encourage children’s natural curiosity and creativity, inspiring awe and wonder.’ (p.60)
Within the secondary curriculum at Key Stage 3, wonder is referred to in the study of Geography:

‘The study of geography stimulates an interest in and a sense of wonder about places’ (DfEE/QCA 2011a).

Within the secondary school curriculum at Key Stage 4, wonder is identified as a potential factor in mathematics:

‘Mathematics can stimulate moments of pleasure and wonder for all pupils when they solve a problem for the first time, discover a more elegant solution, or notice hidden connections’ (DfEE/QCA 2011b).

These diverse references to wonder represent an issue for teaching practice. Wonder is expressed as a ‘given’ in three of the four examples. The environment, geographical ‘places’ ‘science and design and technology’ are cited as sources of wonder, but the nature of wonder is not addressed and its action is not elaborated upon, and nor, indeed, are its perceived benefits. Wonder in these examples is expected to happen via a process of exposure or study. The description for Mathematics at Key Stage 4 is more helpful, with wonder identified in problem solving, elegance, and the perception of ‘hidden connections’. However, this is the sum total of guidance given to teachers regarding wonder within the curriculum. Furthermore, this seems a restricted view of the realm of wonder and wonders. What, for example, of the wonders of history, languages, and biology?

Without additional factors, this could be seen as a sad neglect of a potentially potent co-factor in education. There is a further tension. This arises from The Office for Standards in Education, Children's Services and Skills (Ofsted) and its expectation of ‘spiritual, moral, social and cultural development’ (Ofsted 1994). This expectation is established in the Standards for Qualified Teacher Status (DfEE, 1998) and has become one of the criteria for school inspections. It is referred to by teachers as ‘awe and wonder’ following the phrase’s employment in the first Ofsted Handbook for Inspection (Ofsted 1993), where schools’ provision for spiritual development was judged by pupils displaying ‘a sense of beliefs, the ability to communicate, a willingness to reflect on experience, and a sense of awe and wonder’ (p.57).

Web forums attest to the expectation of ‘awe and wonder’ that persists at inspection time, despite the fact that the phrase is not currently used in the Ofsted handbook:
‘The guy who inspected me said that ofsted are now looking for (history) lessons which contain "awe and wonder" (sd2wilson 2009).

Teachers seek advice from online communities, although it clear that answers are not always forthcoming. The following post on the *Times Educational* site received no replies:

‘ It is my turn to give KS assembly a week on Thursday and having finished HIA Beginnings this Friday I have got 'awe and wonder' as having a week of celebrating it in school. I am stuck as to how I can get this across from Y3 to Y6 as perceptions and beliefs change so much across the KS. Any ideas please?’ (misspretty 2009).

On another post, there is the rhetorical question ‘Isn’t the nature of awe and wonder that it cannot be planned and prepared for?’(deleted286 2009). Another teacher expresses scorn:

‘I speak as someone who can still make myself laugh when I recall the inspector who observed my lesson 3 years ago bubbling with enthusiasm as he told me – with a straight face – that ‘awe and wonder was on the face of every child in my lesson. Bollox’ (Middlemarch 2008).

Finally, there is anecdotal evidence that the requirement has led to ingenious (if disingenuous) thinking. One website tells of a school that named its two parrots Awe and Wonder in order to appease the inspectorate (Diocese of Truro 2009).

Clearly there are issues. And the situation is made worse by the fact that in recent years, government educational policy has emphasised the testing of pupils from Key Stage 2 onwards, aligned to a system of standards that has resulted in pupils being ranked, grouped, and ‘taught to the test.’ (Thomson, Hall, and Jones, 2010; Thomson, 2010; Bragg and Manchester, 2011). The necessary emphasis on performance, coupled with the strictures needed to meet requirements, has been seen as limiting and ultimately impoverishing: ‘Being a ‘successful learner’ often turns out to mean nothing more interesting than doing well in exams.’ (Claxton 2007). Thomson, Hall, and Jones (2010) argue that this focus is essentially counter-productive: ‘the pedagogies intended to promote attainment actually accomplish the reverse.’ (p.639)

The pressure of assessment is a problem compounded by other pressures affecting schools. Dyer (2007) bemoans an ‘overcrowded curriculum’, ‘fear’, and a disconnection with nature, resulting in ‘a distinct lack of magic and enchantment (this does not refer to the supernatural type of magic, simply those powerful ‘awe and wonder’ experiences that drew us into our subject – the ‘wow’ factor)’ (p.394).
Stolberg (2008) in a study exploring the beliefs of trainee science teachers found that there was a disjunction between teachers having conceptions of wonder and their sense of a need for applying this wonder to their practice, or sharing it with pupils. She concludes:

‘(I)t is clear that both teachers and pupils need to be made more aware of the feelings wonder can engender. Pedagogical strategies need to be developed so that teachers can facilitate pupils to reflect on the possible meanings of the wonder, so helping them to develop a mature ‘scientific voice’... the articulation of a view of science that is both personally meaningful but also accurately reflects the spirit of its endeavour. Thus, pupils are given the opportunity to live with the wonder long enough for it to become theirs and be transformed by it’ (pp.1963-64).

Clearly, there are considerable obstacles to wonderment in educational establishments, stemming from policy, practice, and complexities. It would appear that the implementation of a system which emphasises objectives and testing, besides driving out the time and space for wondering, also affects the very awareness of its potential. Perhaps in order for a culture of wonder to succeed, any intervention would need to work in the spaces in-between, a consideration that is returned to in Chapter Five.

2.3 The Heritage of Wonder: In and Beyond the School Environment

As a foundation for the study, this section considers how wonder has been sought to be generated in the past. It is, of course, by no means an exhaustive cataloguing of all traditions sympathetic to wonder and wondering: I have chosen to consider those that have inspired my own practice. The heritage presented here includes traditions that have a clear pedagogical connection and are situated within schools (object lessons, nature tables, direct enquiry), and those that are only occasionally associated with schools (conjuring, cabinets of curiosities, labyrinth building). The traditions that will be considered are: The Labyrinth; Conjuring; Cabinets of Curiosities; Nature Tables; Outdoor Quests; Object Lessons; and The Direct Enquiry. Some of their key characteristics are laid out in the table below:
Table 1: My Inspirations within the Traditions in the Heritage of Wonder

<table>
<thead>
<tr>
<th>Tradition</th>
<th>Era</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Labyrinth</td>
<td>Earliest known example estimated at 2,500 years.</td>
<td>‘Enchanted’ space grown from remarkable algorithm. Multiple uses, from races to meditation. A proprioceptive trick.</td>
</tr>
<tr>
<td>Conjuring</td>
<td>Magic and trickery as old as earliest texts. Conjuring as an ‘honest’ art and craft communicated after publication of Scot (1584).</td>
<td>Practitioners share (or simply demonstrate) acts of the impossible for entertainment.</td>
</tr>
<tr>
<td>Cabinets of Curiosities</td>
<td>Flourished in Europe from 16th Century.</td>
<td>Microcosmic and immersive space housing diverse collections. Ideally devoted to exploration and sharing of weird and wonderful.</td>
</tr>
<tr>
<td>Nature Tables</td>
<td>Can be traced through work of Froebel, Montessori, Pestalozzi, Steiner. Not as common as they once were.</td>
<td>A constructed array of found ‘natural’ objects reflecting season and themes, curated by pupils and teacher in primary classroom.</td>
</tr>
<tr>
<td>Outdoor Quests</td>
<td>Found poet in Carson (1965); grew during progressive movement in education and remains evergreen in practices of outdoor education.</td>
<td>Playful nature study with multiple rules and ways. Particular potential for increasing observation and sensitivity to nature.</td>
</tr>
<tr>
<td>Object Lessons</td>
<td>System of shared exploration of materials originated by Pestalozzi (1746-1827).</td>
<td>Structured examination of objects and artefacts with focus on coming to know Anschauung (Pestalozzi).</td>
</tr>
<tr>
<td>The Direct Enquiry</td>
<td>Rooted in the Empirical practice of, e.g. Lucretius (c.99-55 BC); Francis Bacon (1561-1626).</td>
<td>A reflective, reflexive, empirical pursuit motivated by understanding and communication of a phenomenon.</td>
</tr>
</tbody>
</table>
2.3.1 The Labyrinth

The labyrinth is the oldest artifact considered here. Kern (2000) traces the figure of the labyrinth back to the Neolithic Period. It is a device constructed from a seed pattern of five, a quincunx. By a simple algorithm, an ‘organic’ form that looks like a brain or a seed, is materialized, making a unicursal path to an end or ‘centre’. The form can be traced by hand on paper. Labyrinths can also be constructed as walkable circuits, using materials such as leaves or stones. The history is rich and strange, with the labyrinth being recorded as site of both meditation and ribaldry, and attested to as loci of insight and appreciation (Jaskolski 1997). It is currently being considered as a tool for learning (BBC News 2008). It is surprising that there have been no experimental studies inquiring into the action of labyrinth walking.

In my practice I have come to experience, amongst other things, the labyrinth as a spatial ‘puzzle’: in walking the folds of the labyrinth, the compactness and direction of the paths, moving inward and outward from and to all cardinal points of the compass, seem likely to affect proprioception and awareness of space. The path of the labyrinth often feels impossible in its folding; I can attest that first time walkers will often think that they have somehow taken a ‘wrong turn’ or stepped over the path boundaries, so long does the path feel.

Why else invoke the labyrinth as a potential boon? Its ancient mystery and its emergent properties (its derivation from a seed pattern, for example) could be held to be ‘wonders’ themselves. Furthermore, the wander of the labyrinth might be considered an exploratory multi-purpose happening, which can range from challenge to insight, again with an emphasis on manifestation.

2.3.2 The Art and Craft of Conjuring

There are interesting tensions in the traditions of magic as entertainment. One school of thought holds that conjuring is a tradition dedicated to creating ‘the illusion of impossibility’ (Ortiz 2006). Astonishment and amazement are its chief modes (Harris 1999). As described above, astonishment and amazement are blocks to understanding. This conception of conjuring relies on secrecy and is hard to equate with educational experiences, other than as a prompt for exploration, as considered below. There are, however, other ways of working with conjuring. These ways range from the provision of experiences that serve to intentionally bring about the awareness of the possibility of
wonder, to the teaching of conjuring effects themselves. There is a spectrum of conjuring practice related to the exposure of secrets: at one extreme the audience does not know how a conjuring effect is achieved, but can derive a new appreciation of possibility; at the other extreme, there is the exposure of secrets and techniques which have the potential to educate and empower. This dimension of conjuring can be separated from conjuring which is intended to make people feel ignorant or inferior, or which leads to misconceptions about the workings of the world (‘Bad Magic’, c.f. Chapter One).

At one end of the spectrum of positively engaged conjuring there is considered non-disclosure with emancipatory intent. Conjuring as route to wonder can promote appreciation of possibilities, helping people to ‘see the world in a new light’ (Sharpe 2003, p.184) and providing a reminder that life is ‘full of surprises’ (Burger and Neale 2009, p218). Here conjuring takes on a symbolic dimension, related to an unattributed maxim in conjuring that states that a conjurer should ‘use truth to show illusion and illusion to show truth’. Thoughtful conjurers are motivated by this orientation towards their art:

‘By concentrating upon [the] capacity of magic to give our audiences a more considered view of the nature of perception, and to make them wonder a little more at themselves and the world rather than merely to provide them with that emotion as a directionless state, we give our magic a meaning and an aim. This is meaning inherent in magic and therefore if art is born from this, it is the art of magic itself’ (Brown 2003).

Conjuring that does not disclose its secrets can also serve to motivate. This has been realised particularly in the field of conjuring for children, where attention and engagement have been considered via technical methods, especially those concerning participation and involvement, aesthetics, emotional appeal, storytelling, dramaturgy (suspense, success, failure) and empowerment (Kaye 2005; Yaffe 2008).

These insights into dramaturgy, method, and design also find their counterparts in formal educational settings. What is known as the ‘magician in peril technique’, where the conjurer repeatedly ‘fails’ in his or her attempts to execute an effect, finds a parallel in what Mosteller calls the ‘stumblebum technique’: ‘(Teachers) start out on an example, and seem to make mistakes and get the students caught up in the demonstration helping them.’ (Mosteller 1980, p.14). Pedagogy and conjuring clearly have a lot to teach one another, although to date there has been little documented conversation between practitioners (Schenk and Sondermeyer 1995).
There is another motivational dimension linked to the puzzle element of a conjuring effect. This is where a person who witnesses a conjuring feat sets out to work out the method of its achievement. Although the idea of conjuring effects as ‘puzzles’ does not sit well with some conjurers (Fitzkee 1944, Ortiz 2006), there is a case for the appreciation and celebration of conjuring effects as prompts for imagination and investigation. Bacon’s words ring true:

‘...among the contrivances and tools of humans, we should not condemn tricks and toys out of hand...some of them may be useful for information’ (Bacon 1620/ 2000, p.152).

Rousseau (1762/1979) recounts how both pupil and tutor are intrigued by a magic demonstration at a fairground, and are inspired to replicate the demonstration (p. 173). Although the experience is not entirely positive – the conjurer does not share the investigators’ delight at their replication – it does show how a feat of the seemingly impossible can inspire investigation and the pleasure of discovery.

The ‘use(fulness) for information’ extends to the principles that underlie conjuring. Brewster (1832/2011)) observes ‘...we have sufficient evidence that almost every branch of knowledge had contrib...’ (pp. 8-9). There are effects that rely on principles drawn from mathematics (topology and geometry), physics (centrifugal force, magnetism), and psychology (attention, cognitive illusions), for example. Thus effects could be classified and explored according to the knowledge they embody.

Teaching conjuring, or assisting people to learn conjuring, can also have affective benefits. Schenk and Sondermeyer (1995) refer to Goethe’s belief that ‘the performance of magic by children helps them achieve freer speech’ (p.18). From my own experience, I have seen children display signs of great pleasure and pride at acquiring mastery of a trick knot, materialized with a flourish. Furthermore, the craft of conjuring offers opportunities for mastery and persistence: ‘the mastery of novelty is one of the most constant sources of childhood delight and wonder’ (Keen 1969, p.57).

Teachers who have used conjuring in their classrooms attest to the potential multiple benefits. Solomon (1980) suggests that conjuring offers a ‘pedagogical tool for teaching the principles of sensation and perception’ (p.3) as well as ‘research methods and philosophy of science’ (p.4). He observes that conjuring effects ‘also have the advantage of creating a high degree of interest and enthusiasm among the students.’ (p.7) Bracco
(2006) reports on both the use of conjuring texts to engage pupils studying English language and the affective gains of demonstrating conjuring. I have met teachers who tell me of their successes with conjuring, and attest to, amongst other things, engagement, persistence, laughter, and surprise. However, it is worth flagging up that at the time of writing there were no communities of practice in evidence, no group or forum of teachers for the sharing of this conjuring practice.

Clearly conjuring offers positive opportunities for learners and teachers. On a practical level it is accessible and inexpensive; for the learner it has the potential to motivate, intrigue, empower, and reveal. There are risks – the possibility of a demonstration leading to misconceptions of the established laws of physics, for example – highlighting the need for pedagogical sensitivity.

2.3.3 Cabinets of Curiosities

Arguably, the culture of wonder’s richest blooming happened in the late 16th and early 17th centuries with the establishing and expansion of *Wunderkammer* – ‘Wonder Rooms’ or ‘Cabinets of Curiosities’, sites of ‘representation and knowledge’ (Yaya 2008, p.2). This tradition saw the construction of busy and varied curated spaces which sought to represent the world and its wonders, providing direct experiences with objects and artefacts while allowing the questioning of the concept of wonder itself.

Expansive collections of objects and artefacts were established in European cities (Amsterdam, London, Naples, Siena, and Copenhagen, for example). They were made newly possible by travel and exploration – and the acquisitive passions of collectors – in conjunction with an age of enquiry and expressiveness. These collectors included apothecaries (Francesco Calzolari 1521-1600), botanists (John Tradescant the Elder c.1570-1638 and John Tradescant the Younger 1608-1662); scholars (Jesuit polymath Athanasius Kircher 1602-84); merchants (Levinus Vincent 1658-1727); and emperors (Ferdinand I (reigned 1558-64)). These collections included specimens from the ever-growing known world: shells, minerals, skulls, seeds; living plants and animals; tools, weapons, sculptures, and idols.

These combined exhibits were amassed in environments that would have augmented and afforded wonder and wondering as collectors and visitors grappled with the novel, strange, exotic, and mysterious (Daston and Park (1998), Mauries (2002) Purcell and Gould (1992) and Stafford and Terpak (2001)). Contemporary accounts attest to
admirable educational experiences. Although they should be read with an awareness of bias and unreliability, the clear potency of these loci cannot be ignored. In 1584 the physician Passieno wrote of Calzolari’s collection: ‘everything I saw there I observed and reflected on with the greatest wonder’ (Daston and Park, p.155). In 1646 John Evelyn (1955) recorded a visit to a Cabinet, where he tested the weight of an antler and found that “one branch of them was as much as I could well lift” (p.516). Evelyn’s account is a reminder of the opportunities for understanding via direct encounter – in this case lifting an antler to really appreciate its weight, and the implications of this heft. Accounts attest to immersive and truly multi-modal experiences, where visitors had the opportunity to engage with exhibits in a quest for understanding, further encouraged by the intriguing aesthetic array of items (variously amassed, nested, and juxtaposed) and owners who presided over their collections with considerable dramaturgy (Mauries 2002, Daston and Park 1998). We should, of course, be cautious in our reading; only a handful of reports have survived, and although Cabinets were the sites of new understanding and the honing of empirical science, there were never any reflexive studies to test their efficacy. But from even the most cursory of accounts, we might see the benefit alone in allowing people to encounter chameleons and meteorites.

The tradition of the Wunderkammer lives on in contemporary Cabinets such as David Wilson’s Museum of Jurassic Technology (Weschler 1996), the installation art of Mark Dion (Dion 1997; Endt 2007), and, it seems to me, persists in many a front room, bedroom, and shed.

Contemporary interpretation of learning spaces may assist in helping to understand the potential effectiveness and sheer variety contained within the walls of Cabinets.

Perkins (1992) considers ‘five facets of a learning environment’: ‘information banks’, ‘symbol pads’, ‘construction kits’, ‘phenomenaria’ and ‘task managers’ (pp. 46-48). Table 2 provides examples from Perkins, with examples drawn from the earliest known representation of a Wunderkammern, the catalogue of the Neapolitan apothecary Ferrante Imperato from 1599 (Figure 1):
Table 2. Perkins’ Model of a Learning Space Applied to Ferrante Imperato’s Wunderkammer

<table>
<thead>
<tr>
<th>Facets of Learning Space</th>
<th>Perkins’ Descriptions</th>
<th>Perkins’ Examples</th>
<th>Examples from Imperato’s Wunderkammer</th>
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<tr>
<td>Information Banks</td>
<td>‘a source of explicit information about topics.’</td>
<td>Texts</td>
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<td>Dictionaries</td>
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<td></td>
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<td>Information-processing technologies</td>
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<tr>
<td>Symbol Pads</td>
<td>‘surfaces for the construction and manipulation of symbols.’</td>
<td>Slates</td>
<td>Writing slopes</td>
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<td>Laptop computers</td>
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<tr>
<td>Construction Kits</td>
<td>‘a fund of prefabricated parts and processes with emphasis falling on molar things and actions.’</td>
<td>Lego</td>
<td>The Cabinet</td>
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<td>Laboratory apparatus</td>
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<td>Information-processing technologies</td>
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<tr>
<td>Phenomenaria</td>
<td>‘area(s) for the specific purpose of presenting phenomena and making them accessible to scrutiny and manipulation.’</td>
<td>Aquaria</td>
<td>The Cabinet</td>
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<td>Task Managers</td>
<td>‘elements of the environment’</td>
<td>Teachers</td>
<td>Collectors</td>
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that set tasks to be undertaken in the course of learning, guide...and provide feedback regarding process and/or product.

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**Figure 1. The Wunderkammer of Imperato (1599)**

Using Perkins’ model, a Cabinet of Curiosities can be characterised as a combined phenomenarium and construction kit, with all other facets of a learning space, e.g. symbol pads, contained within it. This richness would suggest an enviable locus for educational experiences. Engravings of Cabinets (Figures 1 and 2), also suggest that as collections grew and traditions evolved, so did the facets of the space. Worm’s Cabinet as depicted in his catalogue of 1655 shows a proliferation of shelves and labelled boxes for the sorting of specimens, demonstrating the way in which the Cabinet developed.
Figure 2. The Wunderkammer of Worm (1655)

There is a train of thought that conceives of the ‘decline’ of the Cabinet arising from the move from uncertainty to certainty, a path from the Baroque to the Enlightenment, as though the understanding that arose from the impulse to wonder and connect led to redundancy, with the resulting development of the gallery and the museum (Saisselin 1999; Mueller 2001). Here again is the theme of wonder’s transitory nature (Section 2.2.3.4).

However, Dewey’s thoughts on the ‘edges’ of taxonomy ring true:

‘A classified and hierarchically ordered set of pluralities has none of the sting of the miscellaneous and uncoordinated plurals of our actual world.’ (Dewey 1925, p.25)

Perhaps this is one of the powers of the cabinet: the restoration of ‘edges’, showing the odd against the even, helping things to stand out for enquirers.

Hooper-Greenhill (1999) calls for a restoration of the curiosity to the modern museum:

‘(I)n exhibitions... we perhaps need to find ways to pose questions, to make things intriguing, to expose discontinuities, rather than to present a seamless and perfect narrative.’ (Hooper-Greenhill 1999, p.143). Perhaps in the clash and jumble of objects
and artefacts, in the very fact that meaning is ‘up for grabs’, lies the power of the Cabinet as a space for learning.

Wonder, in the conception of it centring on encounters with manifestations that prompt exploration, is embodied in the Cabinet. For this reason, an exploration of the potentials and the scaling of the Cabinet forms part of the study presented in this thesis.

2.3.4 The Nature Table

The history of the classroom Nature Table, a co-maintained space dedicated to the collection and presentation of seasonal objects such as seeds, fungi, and frogspawn, has not yet been written. Although still part of the Montessori and Waldorf school environment (Isaacs 2010; Masters 1992), there is a lack of extensive documentation on the tradition. A number of recent campaigns make clear that there has been a perceptible decline in its manifestation (www.bna-naturalists.org/ntable.htm). Tomkins and Tunnicliffe (2006) make a case for the renaissance and promotion of the classroom Nature Table as a focus for observation and reflection, citing correspondence with a teacher who had used the Nature Table for exploratory projects, encompassing phases of collecting, documenting, researching—all framed within the practice of responsibility. In an exploratory study Tomkins and Tunnicliffe (2007) found that pupils in both the first and fifth year of schooling (ages 5-6 and 9-10) had a very positive relationship with displays of natural objects. They identified a number of qualities in this relationship, including novelty and aesthetics, viewing the Nature Table as a clear potential site of wonder. Some of the potential benefits posited by the authors include motivation, the honing of observational powers, knowledge gains, positive attitude, and the development of communication skills (p. 155). My own memories of the Nature Table in my primary classroom in the 1970s chime with this account and its observations. I can remember being fascinated by the ever-changing display of objects both predictable and unpredictable, known and unknown. It spoke to me of riches of the natural world, even the local natural world of Eastwood, Essex. Like many of my peers, I was motivated to bring in objects from garden and parks and, as a class, to curate, arrange, and study the collection. The morning when another class came to visit our Nature Table to see the wealth of exhibits we had amassed, lives on in my memory as a moment of excitement. I can recall feeling something akin to wonder both at the array in its richness and in individual specimens: the jaw bone of a sheep; metamorphosing tadpoles; leaf galls. I have no doubt it added to my love of nature, to my desire to learn about the world, and to
my propensity to share experiences with others. Both these positive associations and a small but encouraging literature have led to Nature Tables featuring in the study and design that follows.

### 2.3.5 The Outdoor Quest

Scholars have long investigated the complex association between children and nature, and the literature is interdisciplinary and vast (Carson 1965; Chawla 2002; Hart 1979, 1997; Kahn & Kellert 2002; Katz 2004). Experiences in nature are thought to profoundly influence a child’s physiological, emotional, and social development (Carson 1965; Cobb 1977) and range of research points to positive effects of this exposure (Children and Nature Network 2011). Research also points out that recent generations have less unrestrained experience in outdoor surroundings and spend more time indoors (Hofferth and Sandberg 2001; Malone 2007).

The wide terrain of outdoor learning has gained attention in recent years. Government reports (House of Commons Education and Skills Committee 2005), popular journalism (Louv 2005), campaigns (Barker, Slingsby, and Tilling 2002) and the sharing of traditions such as the playful Scandinavian pedagogy rooted in friluftsliv or ‘free-air-life’(Gelter 2000) bring awareness and life to the movement or movements.

The outdoor learning experience as a path to wonder has its laureates (Carson 1965; Cobb 1977; Cornell 1979). Amongst the claims for the wonders of activity in nature include eudaemonia, growth, appreciation, observation, mindfulness, challenge, and a wide range of experiences which allow for the extreme affective range of awe and wonder (Keen 1969, Wilson 1984, Abram 1997, Fuller 2006).

My particular practitioner bias has been to consider the idea of the ‘treasure hunt’ or ‘scavenger hunt’, two pursuits that engender happy memories in me connected to surprise, challenge, and really noticing my surroundings. Both pursuits involve seeking and, ideally, finding and sharing. The chief difference between them is this: the treasure hunt unfolds in the pursuit of items that have been hidden, perhaps with the assistance of clues, riddles, and maps; the scavenger hunt is not based on uncovering the hidden but discovering the present and, as such, is both less hierarchical and more open to the novel and unexpected. As with the labyrinth, there is the dimension of ‘wandering’. Equally important is the sensual, challenging, playful, structured pursuit the hunt represents, with its multiple opportunities to experience, question, and wonder. For at least one
commentator, it is the pursuit itself, the practice of seeking, that is most meaningful: ‘Get them to find out. Let this act of finding be more important than what is found.’ (Holmes 1952, p.30).

2.3.6 The Object Lesson

Johann Heinrich Pestalozzi (1746-1827) has been called the ‘Father of Modern Elementary Education’ (Binder 1970, p.298). His ‘Object Lesson’ which Pestalozzi ‘conjured up as a living and breathing endeavour’ (Meyer 1975, p.229) was conceived of as a way of developing pupils’ observational powers and extending their knowledge of objects and artefacts, while allowing an affective, dramatic educational experience: ‘Under Pestalozzi’s sensitive touch the object lesson took on the aspect of a creative performance, and, through vivid insight, the lesson bounced with a sprightliness it had never known.’ (Meyer 1975, p.226)

In the Object Lesson Pestalozzi sought to bring pupils to a meaningful encounter with objects and artefacts. He sought to do this via a sequence of assisted observations of the qualities of things and the piquing of pupils’ interest: ‘curiosity has great value as a sense-foundation for my power of inquiry.’ (Pestalozzi 1801/ 1938, p.82). For Pestalozzi, at the heart of the encounter was the experience of Anschauung, which can be interpreted as a ‘direct experience’, akin to the moment of sensual and cognitive recognition that wonder affords. However, Pestalozzi’s chaotic life and his inability to express his ‘method’ clearly has led to an unhappy transmission of ideas. The very word Anschauung has proved problematic. Translations of the term, it has been argued, have ‘seriously prejudiced the acceptance of Pestalozzi’s doctrine’; Rusk and Scotland (1979) list ‘simple apprehension, direct acquaintance, spontaneous appreciation, personal contact, first-hand impressions, face-to-face encounter, the direct impact of things and persons’ (p.142).

The decline of the Object Lesson is frequently attested to (Raymont (1937), Meyer (1975), Wilds and Lottich (1970) Rusk and Scotland (1979)). Over time, disconnected from Pestalozzi’s educational and philosophical structures – indeed, bereft of playfulness and the spirit of discovery – the Object Lesson became ‘bookish, formal, analytical, and far beyond the comprehension of children.’ (Wilds and Lottich p.379). A system which sought to bring participants to a full encounter with objects and artefacts, led to a distancing of experience. Dickens’ character Gradgrind (Hard Times 1854), with a motto of ‘Never wonder’, is portrayed using the mechanical object lesson to destroy wonder via facts.
Beyond being a salutary warning of how wonder can be expunged from a potentially wondrous encounter (Dewey's cautionary note about 'a classified and hierarchically ordered set of pluralities' again rings true) the Object Lesson remains a reminder of how objects and artefacts can be used to facilitate experiences that engender curiosity, questioning, and knowledge. A contemporary example can be found in Fisher's conception of a 'thinking-centred classroom' where 'objects of interest' allow both questioning and the search for answers (Fisher 1990).

Pestalozzi’s vision of the Object Lesson sought to bring about an awareness and appreciation of objects and artefacts via supported observation and 'direct experience’. It appears that this practice has the potential to assist with seeing things anew, in good detail, in a way redolent of an experience of wonder. For this reason it finds an expression in the intervention that forms part of this study, with, it is hoped, the blessings of Pestalozzi himself, who wrote of his ‘method’: ‘I beg of you but one thing. It is this: separate those of my assertions that may be doubtful from those that are indisputable’ (1800).

2.3.7 The Direct Enquiry into Wonder

Wonder encourages questioning and investigation: what is more appropriate than wondering about wonder itself, particularly if this approach is reflective, reflexive, shared, and vindicated?

Watson (1999), motivated by the government publication Standards for Qualified Teacher Status ((DfEE, 1988) concerning personal, spiritual, moral, social and cultural development, and further inspired by Fisher’s accounts of wonder (1998), worked with PGCE Secondary Mathematics students to understand wonder’s relation to mathematics and mathematics teaching.

Watson found that by bringing the group to a direct awareness of the idea of wonder, an affectively positive and stimulating conversation was generated. A simple geometric exercise that followed this conversation was met with enthusiasm and appreciation. To end the session, a pursuit in which students were asked to write down aspects of mathematics that they thought had the potential to generate wonder resulted in a list that was ‘wide-ranging and exciting’ (p.38).

Waldorf education purports to be ‘built around the sense of wonder’ (Staley 1974). Steiner, for example, suggested ‘Wish, Wonder, and Surprise’ as subjects for
contemplation (Schwartz 1989). Staley, a teacher in a Waldorf school finds ‘wonder’ the ‘most subtle of the three themes’, her class finding initial difficulty in distinguishing it from ‘a certain element of surprise.’ She reflects ‘Where did wonder come from? Well, certainly it came from within the human being, but it also came as a meeting with the outside world... We discovered that you can talk about wonder but it is quite another thing to completely feel oneself in an act of wonder.’ (p.2). After attempting compositions, Staley proposed a meditative study of the school pond, and the compiling of a group journal, inspired by the writing of Thoreau, expanding to include illustrated books on the subject of the detail of snow and water, plants and nature. The class expressed surprise at how much they came to observe in the pond. Staley concluded from the work produced that wonder had been widely and genuinely experienced and, moreover, that this wonder had transformative power (‘As a class we were deeply changed by the experience’ (p.3)). This may only be a snapshot of a small-scale intervention, but it does suggest that structured ‘wondering’ about wonder coupled with active and constructive pursuits can have positive and emergent properties.

The above studies suggest that the inquiry into the phenomenon of wonder itself can be a fruitful approach to wonder and learning, yielding potential multiple benefits for both pupils and teaching staff. ‘Going meta’ (Bruner 1996) is an important perspective in the intervention designed for this study.

2.4 Connecting the traditions with creative pedagogy

What do the traditions considered above have in common beside a rootedness in the phenomenon of wonder? In the years that followed the exploratory research that began this study, a vantage opened that both makes sense of the pedagogical richness of wonder and suggest ways forward sympathetic to the heritage.

Critiques of schools in the thrall of a ‘standards agenda’ (Thomson et al, 2012) have suggested remedies conducive to wonder and wondering which, rather than replacing existing structures, could work alongside them. One of the potential boons of these remedies is the engendering of a school culture which shares much with the selected conceptions of wonder outlined above. The report of the National Advisory Committee on Creativity, Culture and Education (1999), centring on creative practice and its impact in a standards-driven school world, highlight the imperative of positive school ethos and the desirability of the mobilising of creative pedagogical practices (Thomson, Jones, and Hall, 2009; Thomson, Hall, and Jones, 2010; Bragg and Manchester, 2011; Thomson et
Thomson (2010) posits a number of strategies that ‘cut across school conventions’ (p.31) to assist in a more equable and, as with the phenomenon of wonder considered in this chapter, interest-centred, expressive, and joyful range of experiences. The emphasis is on the importance of creative pedagogies which allow for meaningful, affectively positive, and collaborative explorations. Thomson et al (2012), in a study that appeared after the work that constitutes this study, provide an inventory of 19 creative pedagogic practices. These practices chime with the traditions of wonder identified above, and will be returned to in the concluding chapter.

2.5 Conclusion

The work presented in this dissertation represents an attempt to uncover, consider, and enlist the phenomenon of wonder as a boon for educational experiences, with a foundation rooted in literatures both early and contemporary, extending into lived experience and exploratory interventions. The way the phenomenon is enlisted is the subject of the chapters that follow.

This chapter has sought to begin to make clear the manifold potentials of wonder for educational experiences. After considering concepts emerging from the etymology, I have drawn on a range of literatures for a breadth of themes, then moved on to a number of traditions I consider part of the heritage of wonder.

From the literatures, with an eye on educational context, a fair and workable definition of wonder would run:

‘Wonder is a multi-phased and ultimately affectively positive encounter with an eliciting object, artefact, environment, or situation, that prompts questioning and exploration in search of meaning and has the potential to connect to growing knowledge and appreciation.’

Although necessarily reductive, this definition orients the thesis towards the vision of the ways and goals of the study. The chapters that follow will seek to enrich and question this statement, in the first instance through a reconnaissance of reflective projects which seek to capture the lived experience of wonder from samples of the population, moving towards a larger-scale project informed by this exploratory work.

On the basis of the survey presented in this chapter, a number of potential benefits suggest themselves. Wonder’s connections with educational experiences are seemingly many – indeed, for some commentators, wonder is identifiable with learning itself. Excitement,
joy, a desire to know, imaginative thinking, connection, appreciation, and understanding are associated with wonder, and take shape in a number of dimensions, such as mystery and surprise, each with their own charms. However, these benefits are tempered by concerns voiced across the literatures: cautions against impermanence and disappointment; the paths of ignorance, confusion, or inactivity, as represented by associated concepts of awe, amazement, and astonishment. These concerns will prove important when exploring the second question that informs this thesis (‘How can we mobilize the heritages of wonder and popular understandings to design wondrous experiences for school settings?’) by identifying perceived pitfalls that need to be overcome by awareness and ingenuity in the design of an intervention. Indeed, I see that potential blocks and shortcomings can be viewed as part of wonder’s potential, the ‘resistance’ in the ‘materials’ that needs to be sensitively worked with.

Before addressing the ‘how’, I hope to have shown that there is clear indication that the heritage lends itself to adaptation to school-based interventions. Beyond the desirability of evoking wonder, the examples of school practice described above suggest that classrooms can be suitable loci for the constructive exploration of wonder, with the boon of working in the spaces in-between of a standards-driven system. Furthermore, recent studies in creative pedagogy propose ways of working in classrooms that appear to vindicate wonder and wondering, and suggest multiple ways forward, of which this thesis is one route.

The chapters that follow will continue to consider the ways in which wonder is conceived, while exploring how it can be accessed, designed for, and worked with in a school setting, with the goal of advancing understanding and assisting its beneficial evocation.
3 Chapter 3: Methodology

3.1 Introduction

As outlined in Chapter One, this doctoral project into educational wonder grew from a proposal to explore the potential uses of conjuring in – and possibly beyond – the formal situation of a school classroom. From early conversations with my peers and supervisors, it was clear that it was essential to identify and develop a research methodology that would allow me to draw on and consider my own practice as magician, puzzle maker, and game designer. Action research, ‘a practice-changing practice’ (Kemmis, 2009), as considered in this chapter, appeared to answer these requirements.

This chapter details the main features of action research, particularly as espoused by McNiff (2003) and McNiff and Whitehead (2006). I describe the parallels I saw between the practices of the action researcher and the conscientious conjurer, and outline the cycles and methods that were to emerge over the course of the study.

3.2 Initial Considerations

Following an early orienting search into the understandings and traditions of wonder, I considered my evolving aims for the study: to understand how wonder was conceived of, both in the past and amongst the living, and to find a way to design an intervention that drew on this information, particularly in a way that could utilise my past experience, to enable educational experiences that draw strength from the phenomena associated with wonder. Most important of all, I also came to see the desirability of working with others to ‘grow’ an invention that would allow participants to address their own ideas of wonder and come to meaningful and educational expression of these ideas.

Although some histories of wonder connect with the empirical tradition (Bacon 1605/1915; Bynum 1997), during discussion with my peers I regularly met with the opinion that an experimental approach was at odds with the exploratory remit. Wonder and wondering might lead to experimental science, but experimental science as a test for wondrousness was likely to prove troublesome. It was difficult to ascertain a test of or for wonder where variables could easily be manipulated or controls established. My supervisors made clear that there would also be moral implications for experimenting with a ‘wonder curriculum’ in a school, testing groups of pupils while neglecting others.

It was clear that a focus on the phenomenon or idea of wonder and an exploration of ways to harness it for learning would benefit from a qualitative and flexible design. Design-
Based research or co-design was considered (Roschelle and Penuel 2006). However, as a methodology that requires the planned working together of teachers, researchers, and developers, it was ruled out as not the best fit for the exploration at the early stages. Ideally, there would be a methodology that structured the more tentative initial approach, and provided continued guidance during later stages.

3.3 Action Research

Action research presented itself as a solution. This is a methodology with a varied history: in Noffke’s phrase, it has ‘many ancestors, many descendants’ (Noffke 2002). I initially ruled it out on the basis of Bryman’s definition as ‘an approach in which the action researcher and a client collaborate in the diagnosis of a problem and in the development of a solution based on the diagnosis.’ (Bryman 2004, p.537). Upon further investigation I discovered that although collaboration and development hold true for all definitions of action research, the idea of a client or a simple diagnosis are not universally agreed upon. Unlike design-based research, action research does not have the development and operation of an intervention or innovation as its focus, although this is not inimical to the methodology.

There are a range of definitions and consequently a number of schools of thought: practices arising in Cambridge, East Anglia, and Bath, all with their roots in work carried out in the United States in the early to mid twentieth century. The chief variations are the relationship between investigators (one or many) and the fixity of stages in progression of research, from four stages in the work of Lewin, to a schema of increased complexity in the work of Elliot (1991).

All action researches have practices in common, beyond the considerations of ethics and good practice common to all research. These include, in my interpretation:

- The practitioner-researcher is at the centre of the research
- Research is collaborative and can involve many individuals
- The practitioner views his or her practice with an eye to the improvement of a situation
- Steps of action and reflection are followed in a cycle
- Cycles are sequenced in a spiral of advancement
- Presentation of research is an opportunity to discuss validity and legitimacy, and to continue the spiral of practice.
The writings of McNiff and Whitehead in particular informed my approach (McNiff 2003; McNiff and Whitehead 2006). McNiff is clearly committed to the idea of wonder as an element of research: ‘Exercising [philosophy’s] capacity for wonder, I think, is what educational research should be about... For me, educational research is grounded in a special kind of philosophical wonder that has the potential to transform into considered action.’ (McNiff 2003, p.4). As one of my chief questions at the offset was an alignment of my previous practice to a methodology, I was heartened to find wonder being openly addressed. Continuing the search, I found throughout the writings of McNiff and Whitehead themes that resonated with me as a magical practitioner. Their vision of action research, for example, can be construed as acts of considered metamorphosis – characterised, in their own words, by a ‘generative transformational nature’ (McNiff and Whitehead 2006, p.2). I also discerned a vision of the action researcher as a responsible, influencing, creative, and opportunistic agent —mirroring my own beliefs about the ways of the socially engaged magic practitioner.

McNiff and Whitehead’s conception of the agent and agency, via Said, is a call to action: ‘The main responsibility of agents is to ask questions, and not accept complacency or self-righteous justification, their own or anyone else’s. In this sense, they act as public intellectuals (Said 1994) whose job is to interrupt and question the status quo. Why are things as they are? Are they satisfactory? If not, how can they be changed? For action researchers this means that they need always to ask questions and not accept final answers.’ (p.29)

In this idea of the researcher-as-agent I saw a parallel with the role of the magician-as-trickster, particularly in the role of beneficial ‘disruptor’ via, for example, the asking of (thought-provoking research) questions. Here, however, there is an important distinction to be made: the role of the researcher-as-trickster is not to deceive but to reveal, and to assist others in coming to their own revelation or meaning. It is not about ‘delivering’ information or controlled experiences, but catalysing a process that enables beneficial experience. To develop this idea, then, would require the substitution of awareness-raising events for trickery. My solutions to this are detailed in the chapters that follow.

The idea of responsibility ought, of course, to be paramount to all research and all behaviour. As discussed in Chapter One, it was an early realisation for me as a performer of magic effects that the creation of illusions required sensitivity to one’s audience (or,
ideally, participants), judging from participants’ responses and comments. Responsibility, in the sense of ethical practice, is considered below (3.4).

I also saw in the word ‘responsibility’ the need for the magician to respond to the audience’s responses themselves. Response is not only key to the impact of a magical effect – it is also one way that the magical practitioner learns the art and craft of conjuring. By extension, this is how the practitioner learns to practice. Schön writes about this process of responding to challenge:

‘The practitioner allows himself to experience surprise, puzzlement, or confusion in a situation which he finds uncertain or unique. He reflects on the phenomenon before him, and on the prior understandings which have been implicit in his behaviour.’-(Schön 1983, p. 68)

In my experience, I had rarely felt satisfied with a performance unless new ideas or situations arose that made me ‘think on my feet’ and adapt. To wish for this beneficial disruption and to channel this response for the generation of wonder and learning felt like a good principle for the cycles of practice.

This wish for the unexpected connects to a commitment to opportunism as a way of practice. McNiff and Whitehead call this ‘entrepreneurialism’ in data collection. They advise that ‘(a)s well as planning to gather the data, you also have to be on the lookout for opportunities.’ (p.146). Conjuring teaches a practitioner to be on the lookout for opportunity. Conjurers attest that a ‘prepared mind’ and watchful eye can lead to the working of seeming miracles. (Harris 1999; Burger and Neale 1995). Although my research was not geared towards creating the ‘illusion of impossibility’ (Ortiz 2006) I was hopeful that the research cycles would expand beyond my expectation. Looking back on the work, I realise that, even with this commitment to the idea of opportunism, I had not anticipated the many opportunities that would arise. On many occasions I found myself in conversation with people about wonder. Some of these moments will be described in Chapter Four.

The ability to respond and work opportunistically are enmeshed with ideas of creativity. For McNiff and Whitehead, creativity should affect all phases of the work, from planning to interpretation. For the negotiation of access, for example, McNiff and Whitehead invoke MacDonald’s concept of ‘creative compliance’ (1987), which struck me as consistent with the idea of metis or ‘cunning intelligence’ (Detienne and Vernant 1991).
Creativity should also inform data collection. ‘Be imaginative’ and ‘Think creatively’ are McNiff and Whitehead’s mantras. (p.114)

Finally, the idea of influence connects the practitioner of magic and action research. This finds its darkest expressions in the figure of the magician as mesmerist, or misdirecting deceiver. McNiff and Whitehead consider the term as something beneficent, distinct from imposition. They counsel, ‘rather than thinking about changing things, think about exercising your influence’ (p.114). In this distinction, realised by ‘a change that comes from within, and in accordance with other people’s felt wishes’ (p.51) I saw a reflection of my wish for the practice of magic, in keeping with Sharpe’s vision of helping other to ‘see the world in a new light’ (Sharpe 2003, p.184), as described in Chapter Two. This would require sensitivity in not forcing a response, but fostering, for example, positive affect, with the distinction that the influence leads to exploration and meaning, not to inactive astonishment or restricted amazement.

3.3.1 The Phases of Action Research

I envisioned that as the research proceeded from cycle to cycle there would be an expansion of the locus of action and a corresponding enrichment of methods. Thus the early explorations constituting the ‘reconnaissance phase’ (Elliott 1991, p.69) would focus on eliciting participants’ thoughts about wonder and would use questionnaires or worksheets; as the research expanded to the trialling of wonder-eliciting displays or interventions, another dimension of methods would need to be employed, such as video-cameras to capture participants’ reactions. A method that would remain throughout would be the use of field notes and a journal to assist reflection and design.

Throughout, in keeping with the transformative agenda of action research, I had an eye on whether or not the act of seeking wonder via the practices of the conjurer (and, in later explorations, evoking wonder via the provision of interactive exhibits) could itself influence positively. I expected to determine the success of this by observational measures and the responses of individuals, for example, in a participant’s voicing of insight into, or appreciation of, wonder in their lives.

In the following sections I describe the phases on the spiral paths, and my anticipation of them, under the four terms attributed to Kurt Lewin, the social psychologist who, in 1946, first coined the phrase ‘action research’ (Lewin, 1948; Kemmis, 1980). They are presented as a record of my considerations prior to entering into the cycles of practice.
These four basic phases or ‘moments’ (Kemmis and McTaggart 1988) are: planning; acting; observing; and reflecting.

3.3.1.1 Planning

McNiff and Whitehead (2006) suggest that the action researcher begins by considering his or her values, voicing questions such as ‘How would I improve my work?’ (p.7). My research was motivated from the offset by the idea of cultivating learners’ productive wonderment. I had seen the techniques and apparatus of conjuring and mechanical puzzle design as potential tools to motivate, guide, and provide. As discussed in Chapter One, a concern I had from the offset was what Ainsworth and I called ‘Bad Magic’ – the sort of conjuring demonstration that lead to misconception in the audience, or blocked investigation and understanding.

I anticipated that I would plan my research by considering my own practice as beneficial worker with wonder, or ‘thaumaturge’. I had a wealth of my own work to consider, ‘fragments shorn against my ruins’ (Eliot, 1922) in the form of journals, notebooks, and props. I would scour these in the search for clues – or ‘clews’, useful threads that would help me find ways through a vast terrain and, to extend the metaphor, weave a net for the harnessing of wonder.

Considering goals and practice led to a number of questions which helped me plan the research. The main research questions gave rise to connected questions:

- ‘How do individuals conceive of wonder?’
- ‘How do I adapt my practice as a conjurer to that of an educational practitioner and researcher?’
- ‘How do I work with others to help others to wonder and learn?’

These questions, which were arrived at through a gradual refinement as the exploratory research grew, are returned to in Chapter Four.

3.3.1.2 Acting

The first phase of action, or the reconnaissance phase, would, I anticipated, involve conversations with a multitude of people, informed by McNiff’s edict that a ‘dialogue is always a dialogue of equals’ (2002). This would take the form of seeking the conceptions, memories, and ideas of people, considering the wonder and learning nexus, and trying out ways potentially conducive to wondering. I also anticipated that there would be a ‘show’-
based element to this reconnaissance work, as befitting my past experience: designing small happenings or events which would generate responses that could be considered for further iterations or innovations.

I anticipated collecting data via questionnaires and interviews (with both specialists and a wide sample of the population). I also anticipated being open to opportunities as they presented themselves.

3.3.1.3 Observing

From my initial journeys into the heritage of wonder, which had revealed a multiplicity of generative instances and ideas, I expected that any explorations into lived wonder would yield a wealth of material to work with. I welcomed the thought of data which would confront my expectations (Winter 1982, p.162). I anticipated that this data would take the form of documents generated by myself as practitioner and by people as co-researchers, as well as objects and artefacts that embodied participants’ sense of wonder. To understand this data, I would take a constant comparative approach, seeking guides for understanding and design (Wellington 2000) whilst looking to participants and the data itself to present ways of working – to act as clews for progression. Moreover, I foresaw clews in the heritage of wonder, in particular the practice of working with constructed Cabinets of Curiosities as a locus of meaning-making (as described in Chapter Two). I saw such arrays as a way of sense-making and classification, where the ‘shuffle of things’ (Bacon 1595/2002) could lead to new understanding, like a multifarious card-sort. The data collected in the exploratory research and intervention is documented in Chapters Four and Five.

3.3.1.4 Reflecting

Although, following Lewin (1946), reflection is frequently identified as a distinct phase of the action research cycle, commentators are clear that it must be considered an integral part of all phases. Tripp (2005), for example, makes a point of removing reflection as a distinct phase in order to highlight that it should inform all practice.

As a magician I realised that I was accustomed to the process of reflection, and aware of its importance as, for example, a way of improving and understanding the impact of a conjuring effect. From a young age I had performed magic for family and friends – inevitably an audience always ready to offer suggestions and food for thought. When I began performing as an entertainer at children’s parties from the age of thirteen, I had
kept both a log of performances and a critical diary to help me identify strong and weak points in my act, and to collect ideas that would inevitably arise. It was later in my life that I discovered the writings of Schön (1993) and came to realise that as a conjurer I had developed a working understanding of ‘reflection-in-action’ and ‘reflection-on-action’. The former, I suggest, arises because the art and craft of conjuring (at best) relies on a sensitivity to one’s audience (or, preferably, participants), expressly through their reactions:

‘Don Alan used to say ‘Watch their faces.’ When we watch their faces, if we are honest with ourselves, we see that some of the things we are doing are working, and others just aren’t. I think watching their faces may be the final arbiter.’ (Burger and Neale 2009, p.222)

After any magic performance, I established the ritual of critical review and recording of moments, plus ideas that had materialised in the interim. This self-reflection and criticism I have always considered paramount – and part of the pleasure of praxis.

I anticipated that the action phases of the research would be permeated by written and recorded reflections. To this end, I foresaw that notebooks and a tape recorder would be part of my practitioner’s kit – as well as the time in which to use them.

3.4 Ethics

In the practice of conjuring, the term ‘ethics’ is chiefly connected to a code of conduct addressing intellectual property and the protection of secrets (magicethics.com provides a current summary). For a magic practitioner-as-researcher the issues of deception loom large. At the beginning of the study, I was prompted to review my practice and came to see that from very early experience in the field, I have been motivated by the exercise of ‘kindness’. This has been shaped over the years by my interest in Buddhist, Taoist, and Epicurean philosophies (Yun 2002; Watts 1975; Epicurus 1994). In short, this has meant that I have sought to use conjuring to delight and inform, rather than to unsettle or shock. It has influenced both the material I have chosen to work with, as well as my words and presentations.

My ethics developed in the field of practice appeared a good fit with the concerns of participant support and democracy central to action research (McNiff 1988, p.124). Research guidelines provided by the British Educational Research Association (BERA
2004) provided a clear and ethical path. Furthermore, ethical approval for the cycles of research was sought through the University Board of Ethics.

The issue of deception was addressed from the offset (Marar 2008). I established that at no point in the research would there be what Robson calls ‘questionable practice’ arising from deception e.g. coercion, invading privacy, stress (Robson 2002). Conversations with supervisors and peers made it clear that it was important that I engaged with the subject of ‘dramatic’ deception directly e.g. in the presentation of the seemingly impossible as stimulus. As with earlier practice, I was particularly focussed on putting checks in place against misconception. It meant that the conjuring effects were always presented within a referential framework: when I came to demonstrate the ‘impossible’ I made sure that participants understood that this was a conjuring effect or an illusion. As the exploration developed, I found that I used few demonstrations of conjuring, preferring to get to the wonder via conversations or directed activities. My agenda was also made clear in conversation with all participants: I was seeking to explore and understand the phenomenon of wonder in order to help in the design of an invention for use in schools.

This necessary openness characterized all of the research I undertook. In early reconnaissance, this would be expressed clearly in interviews (e.g. the Street Interviews) or in a printed statement (e.g. the Comments Book). As the exploratory research gave way to the cycle of classroom intervention, informed consent and parental/guardian permission was sought by the distribution of a fact sheet and a registration document. The fact sheet outlined the nature of the intervention and encouraged pupils and their parents or guardians to write to me, my supervisors, and the board of ethics at the University of Nottingham, in the event that they had any questions about the proposed study. The registration document was an opt-in pro forma, which made clear that participants would be filmed for some of the work. An option of working in a screened-off area for pupils who did not wish to be filmed was provided.

Permission was sought and received for the presentation of findings at conferences. In the case of the classroom intervention, no information was presented that allowed for the identification of pupils. All names of pupils and staff have been made anonymous in this dissertation. All data have been kept securely in accordance with the Data Protection Act, and have only been accessible to myself and my supervisors.
3.5 Outline of the Action Research Cycles

There follows a brief description of the main projects of the research as they arose. There were five distinct cycles, with the first cycle consisting of eight explorations which aimed to collect individuals’ conceptions of wonder in order to assist in the development of the later cycles. The later cycles sought to use the experience of the first cycle to design and operationalise an intervention for educational wonder that could be run in school classrooms. The cycles are described in greater detail in the chapters that follow.

Cycle 1: Reconnaissance

The Reconnaissance phase grew from the first research question (‘What is wonder?’), alongside and frequently through the prism of the second research question (‘How can we mobilize the heritage of wonder and the insights of the living for the design of wondrous experiences in school settings?’). Its aim was to establish useful insights in the form of, for example, a toolkit of descriptions or design tenets, and to trial activities, all of which would allow for further exploration into and evocation of the phenomenon. This initial phase took the form of eight explorations, each of which addressed conceptions of wonder as held by living individuals. The explorations were varied and to some extent emergent, allowing for opportunism, for example, in the case of explorations 2, 6, and 8, which arose as opportune commissions.

Exploration 1: The Magic Table

6 December 2007

Method(s): Interview

Motivated by considerations of ‘wondrous’ objects and artefacts as ways to allow wondrous experiences to occur, I set up a table of exhibits that had worked to pique interest, questioning, and interaction in my past practice. Here was a blend of the heritage: a small ‘Cabinet’ with an element of the Nature Table, redolent of the conjurer’s ‘magic table’. My supervisors were asked to consider the array as a prompt to a critical conversation.

Exploration 2: The Magic Show Questionnaire

7 December 2007

Method(s): Questionnaire
Following a magic show for seventeen graduates at the School of Education, a questionnaire was distributed. Despite a low return (five questionnaires), they proved a helpful insight into the diverse ways wonder is conceived of.

Exploration 3: The Wonder Cupboard and Questionnaire
February 2008
Method(s): Questionnaire

The second questionnaire was designed to be collected and posted. Continuing to work on campus, I prepared the equivalent of a post box which was installed in the corridor of the Learning Sciences Research Institute. The box carried instructions for the completion of questionnaires. Twenty questionnaires were collected.

Exploration 4: The Comments Book
22—24 February 2008
Method(s): Shared Journal; Interviews

I thought there was good sense in consulting practitioners most frequently associated with wonder: conjurers. I attended the 56th Annual Convention of the Blackpool Magicians’ Club, the world’s largest international magic convention, taking with me an exercise book in which I intended to collect practitioners’ thoughts about the phenomenon of wonder.

Exploration 5: The Street Interviews
April —June 2008
Method(s): Interviews

From the offset of the research, I realised that wide sampling was key to understanding individuals’ ideas and experiences of wonder. As Chapter Four outlines, by undergoing the earlier small-scale investigations of Explorations 1-4, I had a better sense of how to proceed in collecting widely.

I took to the streets of two towns in Derbyshire with the intent of conducting short but focussed interviews with passers-by. Thirteen visits took place, and 221 responses were collected.

Exploration 6: The Royal Society Summer Exhibition, ‘Wonder in Carbon Land’
Preparation: February—June 2008; Show: 30 June—3 July 2008

Method(s): Observation; Interviews

As mentioned earlier, I anticipated that the research would grow to the design of wonder-showing and -eliciting events, consistent with my aim to develop wonder work for use in schools. Early on in the research, I was invited to work with a team of scientists to produce an interactive stall about the wonders of the element carbon.

The exhibition was an opportunity to try tenets for design that had been derived from the ongoing literature reviews and research cycles. While considering the messages we wished to communicate, we also paid attention to the aesthetics and affordances of the exhibits.

Exploration 7: Street Interviews 2
August—September 2008

Method(s): Interviews

This second phase of street interviews used a slightly different format for the record sheet. I was motivated by the relative scarcity of children’s voices amongst the data collected on the first foray. There were 15 visits, yielding 317 responses.

Exploration 8: LSRI Launch Event: ‘Cabinet of Learning Curiosities’ and ‘Seed Labyrinth’
7 November 2008

Method(s): Questionnaire; Interviews; Observation

I was asked to create a ‘wondrous’ display for the Learning Sciences Research Institute, as part of its official launch. To this end I produced two displays inviting interaction, both inspired by the heritage of wonder. With a colleague I produced three display cabinets of learning and teaching artefacts, constituting a Cabinet of Learning Curiosities. These were accompanied by questionnaire/information sheets, which invited participants to comment on the exhibits and consider what they would add to the display, although only 4 were returned to my colleague. The seed labyrinth, constructed from sunflower seeds, was, I anticipated, a chance for participants to experience an ancient ‘learning space’. As host of this space, I anticipated having potentially illuminating conversations with visitors about the experience of walking a labyrinth, and the ideas informing my research. Twenty-five
people walked the labyrinth in timed slots, though the exhibit drew crowds throughout the day.

Cycle 2: Primary Intervention Research and Design

September 2008—March 2009

Method(s): Interview

From September I began to put together a package of materials that could meet my aim of producing a wonder intervention for schools. In September I had my first meeting with a teacher, Mr Oak, who offered me twelve sessions to work in his school.

This cycle consisted of conversations and interviews with peers, supervisors, and teaching staff. I met with five teaching staff to talk educational wonder. Insights and issues from interviews, with the toolkit derived from the ongoing review of literature, leading to the drafting of an intervention. It lasted until the intervention was launched on 30 March 2009, after which a new cycle of reflective planning and action was initiated.

Cycle 3: Primary Intervention, ‘The Wonder Boxes’


Method(s): Analysis of Questionnaires/Worksheets/Reports/Artefacts; Observation; Interview.

The Wonder Box system was a working vision of an educational wonder intervention, which was run across seven connected modules in a primary school in Nottingham. The intervention, which was conceived of as a way of initiating pupils into and assisting them in the role of ‘wonder workers’ via the practical invocation of the heritage, had several layers. At the beginning, conceptions of wonder were sought from pupils via structured events and materials such as questionnaires and worksheets. This shifted as pupils were encouraged to become direct enquirers into wonder – addressing both their own growing conceptions, and the conceptions of peers and family, while researching the heritage via books and the Internet. Pupils were provided with diaries (‘Wonder Passports’) to assist them in the search. Further connected pursuits saw pupils working together to produce displays and events for others – initially amongst themselves, but expanding to include the year group and finally the whole school. Pupils were encouraged to interpret the objects they sourced, and the artefacts and exhibits they produced, to assist in their
understanding of the concept of wonder and to assist them in the production of ‘wonderful’ educational experiences for their growing circle of visitors/participants.

This package for the generation of educational wonder is the focus of Chapter Five.


January—March 2010

Method(s): Teacher Reports

In keeping with McNiff and Whitehead’s entrepreneurial approach to research (2006), I was keen to pursue the opportunity that opened up when I was contacted by a secondary school teacher in Canada, who wondered if I could either address his science class on the subject of wonder, or send the class some materials to test. After further communication, we agreed that I would produce two documents that would detail an adaptation of the Wonder Box system, with the teacher providing feedback on the unfolding of events. This is the subject of Chapter Six.

Cycle 5: Packaging the Intervention 2: The Wonder Box Handbook

March—June 2010

Method(s): Teacher Reports

In March 2010 at a conference for teachers I delivered a presentation on the Rabbit Island Wonder Box project. I invited teachers to get in touch with me if they wanted to try out a wonder-themed document, and asked for suggestions of what would help them most. A large format (A4) colour handbook of 117 pages was the result. This is the subject of Chapter 6.

3.6 Data Analysis

In the action research of McNiff and Whitehead (2006), data is subjected to interpretation to show the learning and experience of participants. It was clear that this would be important for evaluation of the main intervention. For the exploratory researches, attestation of learning was considered (as Chapter Four makes clear); however, for the majority of the investigations, it was the collection and scrutinising of conceptions that formed the focus. Here I sought to illuminate the material I collected via content analysis, influenced by the Constant Comparative Method as described by Wellington (2000). This process sees data, such as transcripts of interviews, subjected to regular scrutiny in the
search for emerging patterns, shaped either by similarity or difference. Importantly, data
is returned to regularly in the quest for insight. The focal use of data in the reconnaissance
was for the illumination of the phenomenon of wonder as experienced by people, leading
to a ‘toolkit’ of *materia medica*, a model of stages for educational wonder, and a set of
design tenets for developing wondrous things and experiences. For the intervention study,
with its goals of wonderment, construction, and propagation, data was considered in light
of the goals, although an interest in how individuals conceived of wonder remained.

McNiff and Whitehead (2006) favour the collection of learning testimonials from
participants. I was unsure about the practicalities or suitability of soliciting testimonials
during the exploratory research, particularly given that I foresaw my earliest explorations
as a mountebank’s ‘fly pitching’: I anticipated setting up, interacting, and being content
with brief moments of participation – not sufficiently long encounters. However, the
interviews garnered the equivalent of learning testimonials from participants when the
research questions were addressed, yielding participants’ thoughts on both the nature of
wonder and its potential for educational experiences. Finally, as mentioned above, I
anticipated that the heritage of wonder would provide precedents for the interpretation of
data, in the way that a Cabinet of Curiosities constitutes an exploratory learning space and
Object Lessons facilitate the appreciation of an entity.

3.7 Summary

At the beginning of the project the envisioned trajectory of research resembled the
following sequence:

- Consider lived experiences of wonder in parallel with a continued exploration of
  heritage, with a view to enhancing practice for the benefit of others;
- Assemble a small battery of wonder-eliciting devices or events for sharing with
  participants derived from the heritage identified;
- Consider the data elicited from individuals, and the devices in light of responses,
  including own reactions and considerations of learning with reflection and
  criticality;
- Use all the above stages to design a larger scale intervention that could be run in a
  school;
- Prepare a set of materials that will allow teachers to run wonder-based
  educational experiences in their schools.
McNiff and Whitehead’s emphasis on the importance of creativity, responsibility, positive influence, united in the idea of agency, were essential in orienting my practice and preparing and sustaining the research. This vision of action research married with my understanding and methods of my own practice appeared to be a fitting and potentially productive methodology for the study. McNiff’s avowal that wonder and wondering are themselves integral to the methodology was encouraging (McNiff 2003). Anticipating how the figure of the conjurer or ‘worker with wonder’ could be reconciled with the idea of an action researcher assisted progress considerably. By being mindful of the essential phases of the action research process, while being critically open to unexpected turns, I felt prepared to embark on a journey into living wonder.
4 A Reconnaissance into Wonder

4.1 Introduction

This chapter presents a fuller description of the reconnaissance cycle of research outlined in Chapter Three. This led from initial small-scale explorations on the campus of the University of Nottingham (Explorations 1, 2, and 3) to larger surveys on the streets of two large towns (Explorations 5 and 7). The explorations were interspersed with planned exhibitions and presentations for a variety of audiences that were an opportunity to disseminate findings, promote and explore wondering, and allow for reflection upon practice. This formed the spiral that led to the design and running of a wonder invention in a school, as detailed in the next chapter.

Two questions shape this chapter and motivate the research to come. These questions were asked, returned to, and themselves questioned as the project grew:

1. What is ‘wonder’? i.e. How is it delineated in literatures? How is it popularly understood?
2. How can we mobilize the heritage of wonder and the insights of the living for the design of wondrous experiences in school settings?

Each of these questions and the questions they connect to influenced the path that emerged and find realization in both the exploratory research and the interventions it lead to.

In describing here each of the explorations I have used the traditional action research stages of ‘planning’, ‘acting’, ‘observing’, and ‘reflecting’ outlined in Chapter Three as sub-headings to shape the account. Rather than attempt a sequence of discrete but disjointed passages, I have used the headings to advance the account: thus there are times when the narratives of ‘acting’, ‘observing’ and ‘reflecting’ necessarily overlap.

4.2 Initial Planning

From the beginning, I had an idea of where I wished the research to lead. At my interview for the Learning Sciences Research Institute we had discussed the idea of a ‘Box of Learning Delights’, an invention that could be taken into a school for the benefit of the school community. To get there, I considered how my past experience as a conjurer could be of benefit, as well as how insights from literatures could strengthen the work. These considerations form the narrative of Chapter Two.
I anticipated that the work would begin with simple exploratory projects rooted in the heritage that would feed into later more complex cycles. I hoped that as the explorations progressed they would not only increase my understanding of the phenomenon of wonder and its generation, and offer guides for design, but also assist others in its realisation. I saw the benefit of carrying out the initial cycles at the University of Nottingham. I felt that this would be a supportive environment to try out different methods before taking them into the world beyond. The interdisciplinary nature of the Learning Sciences, bringing together academics from the fields of Education, Psychology, and Computer Sciences, would also facilitate interactions with a wide range of researchers with potentially different insights into wonder and learning.

Table 3 shows the timetable and datasets generated within the eight exploratory projects.
Table 3 The Exploratory Research Datasets

<table>
<thead>
<tr>
<th>Project</th>
<th>Dates</th>
<th>Participants</th>
<th>Datasets Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Magic Table</td>
<td>6 December 2007</td>
<td>Supervisors</td>
<td>Photographs (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Notebook</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reflective Report</td>
</tr>
<tr>
<td>The Magic Show Questionnaire</td>
<td>7 December 2007</td>
<td>Research Colleagues</td>
<td>Questionnaires (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reflective Report</td>
</tr>
<tr>
<td>The Wonder Cupboard</td>
<td>February 2008</td>
<td>Academic Institute</td>
<td>Questionnaires (20)</td>
</tr>
<tr>
<td>The Comments Book</td>
<td>22-24 February 2008</td>
<td>Magicians</td>
<td>Shared Journal (lost)</td>
</tr>
<tr>
<td>Street Interviews 1</td>
<td>April-June 2008</td>
<td>Pedestrians</td>
<td>Written responses (221)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Correspondence: letters (3), emails (24)</td>
</tr>
<tr>
<td>Summer Exhibition</td>
<td>February-July 2008</td>
<td>Exhibition goers; school groups</td>
<td>Notebook</td>
</tr>
<tr>
<td>Street Interviews 2</td>
<td>August-September 2008</td>
<td>Pedestrians</td>
<td>Written responses (317)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Correspondence: letters (7), emails (6)</td>
</tr>
<tr>
<td>Cabinet of Learning Curiosities and Seed Labyrinth</td>
<td>7 November 2008</td>
<td></td>
<td>Notebook</td>
</tr>
</tbody>
</table>

Constructions made or completed by participants have been italicized.

4.3 Exploration 1: The Magic Table (6 December 2007)

4.3.1 Description

The Magic Table was prepared for supervisors Ainsworth and Sharples as focus of a supervisory meeting. Figure 3 presents an overhead view of the table at the end of the
meeting. It was an array of objects and artefacts set up for consideration, addressing the question ‘Can an object be considered intrinsically wondrous?’

4.3.2 Planning

By December 2007 I had produced two reports on the heritage of wonder. The first considered histories of wonder and wonder working. The second considered the idea of ‘devices of wonder’. In response to the second piece of work, Sharples suggested a supervision meeting dedicated to the consideration of objects, addressing in particular the question ‘Can an object be considered intrinsically wondrous?’ My response was to consider a collection and display of objects and artefacts that would allow for examination and consideration, allowing discussion of Sharples’ question, and, I anticipated, the raising of issues and ideas – and, I hoped, the piquing of curiosity, the exchanging of information and theory, and, ultimately, an experience we could conceive of as wondrous.

The display represented my idea of wondrous exhibits – things that have either featured in Cabinets of Curiosities in the past (shells, teeth, relics) or simply struck me as curious and interesting (mechanical puzzles, anamorphic images). Furthermore, I selected these
objects and artefacts for what I thought of as their potential learning journeys – I asked of each item ‘What can we learn from this?’ Examples of the wonders proffered include:

- A phial of the oil of absolute of violets
- A device used by cowherds to secure horses
- A selection of bird calls

The phial, for example, I felt would allow for a sensory experience of a possibly novel and striking smell. Beyond this initial encounter, there would be a phenomenon inviting further consideration: the odour of violets (*Viola odorata*) is known to induce temporary anosmia in the smeller as a result of the action of the compound ionone on receptors (Ackerman, 1991). In other words, the odour of violets can be unexpectedly fleeting. This experience could, therefore, lead to a discussion of the confounding of expectation and the physiology of smell.

I considered the exhibits’ placement in the array, trying out different juxtapositions so as to appeal via contrasts and similarity, using my judgement based on my experience of creating arrays for magic shows, and reflecting on the practice of collectors in their Cabinets of Curiosities, as adumbrated by the literatures. On a table in the LSRI, I trialled different arrangements, allowing the objects and artefacts to suggest connections. Thus I considered placing a glass eye next to a model of the human liver (similarity of type) and considered placing the feather of an African Grey parrot next to a key (contrasting natural object with artefact). The chief consideration was the appeal to the eye; beyond this the interplay of exhibits, their connections via taxonomies or puns, were there to be discovered but were not essential for appreciation. This preparatory ‘play’ meant that I had pre-established connections between the items, helping to speed up the process of arrangement when it came to the session. I anticipated that the table would take ten minutes to assemble.

Ainsworth and Sharples were not briefed about the occasion before the beginning of the session. I thought this would ensure a ‘fresh’ reaction, and a more spontaneous experience. I also thought it fitted the tradition of the fly-pitcher or mountebank assembling a stall for the enticement of passersby.

4.3.3 Acting

The table was assembled on the afternoon of 6 December 2007 in the office of Sharples. I told Ainsworth and Sharples that I would need ten minutes as preparation time, and
provided them with a number of books to look at while I unpacked my case and arranged the table. I rang a bell announcing the commencement of exploration – Ainsworth and Sharples were told that they were permitted to look for three minutes, but were not allowed to touch.

Ainsworth and Sharples were asked to indicate three items they wished to explore further. Ainsworth chose a small black box, a padlocked wooden chest, and a clenched wooden hand. Sharples chose a wooden box, a matchbox and a semaphore signaller. The reasons for selecting these items were discussed.

Ainsworth and Sharples were then told they were each allowed to handle one of the objects. Sharples selected the matchbox. This proved not to be fully examinable at first as it was a conjuring trick, demanding operation by myself in order to produce a block of metal from within. Sharples confessed intrigue and offered suggestions as to how the effect worked. Ainsworth selected the black box which, upon opening, exploded via a cap detonating device. Sharples leapt backwards and was visibly startled; I was gently reprimanded by Ainsworth.

There followed a discussion prompted by the items on the table. We considered the experience as a whole and I recorded some of the issues that had arisen (presented below in ‘Reflecting’).

After Ainsworth had left Sharples told me he had brought in some items that he considered wondrous:

- A gyroscope
- A set of acetates for exploration of Moiré patterns
- A vintage matchbox

The gyroscope led to a discussion on engineering and the acetates allowed a moment of marvelling at optical effects. When I picked up the matchbox a concealed mechanism caused it to vibrate and make a loud noise, a milder but no less surprising version of my detonating box. We marvelled at the synchronicity.

4.3.4 Observing

The arrangement of the table took fifteen minutes, time which Ainsworth felt was wasted as the session itself only had an hour to run. This could have been avoided if I had been able to prepare the exhibit in advance, or had a portable display.
Ainsworth and Sharples told me that not being allowed to touch the exhibits heightened the experience for them. Sharples told me it made him aware of his sense of smell. Ainsworth was concerned that this hands-off experience could be frustrating for some participants.

For the choice of objects, it was clear that curiosity about the contents of the containers (the clenched hand serving as a holder for a concealed object) was the chief motivation. The only exception was the semaphore signaller, which Sharples chose because it made him feel nostalgic for analogue communications systems.

Perhaps the most salient aspect of the session, however, was the upbeat nature of the venture. Despite reservations about time and restrictions, Ainsworth attested to the ‘festive’ nature of the event, as though the items were presents waiting to be unwrapped. The fact that the selective ‘unwrapping’ entailed a genial, engaged, and wide-ranging conversation which remained centred on things and their affordances was, I felt, an indication of the power of an encounter to facilitate wonder and wondering.

4.3.5 Reflecting

It struck me that the tabletop array was an excellent locus for exploration and discussion, allowing many topics to be considered. The interaction provided a useful checklist for the ensuing explorations, presented below. For example, point four helped me see the importance of affordance (Gibson 1966), especially in the potential exploration and meaning that any given object could allow.

Perhaps the most important insight, however, was that of kindness. The exploding box had left Sharples and Ainsworth visibly startled, particularly Sharples, in whose hands the explosion occurred. At the very moment when Sharples came close to falling across the table, I vowed not to use startle techniques in any future array or experience. I would not rule out suspense or surprise, but would avoid anything that could cause a sudden shock.

There were, of course, missed opportunities. Looking back it would have been helpful to the research to ask Ainsworth and Sharples to record their responses. The conversation would have benefitted from being recorded, such was the range of topics covered. The Table would also have lent itself well to further iterations, as a focus of continued consideration.

The main points that arose from the conversations are summarised here to give an idea of how this early cycle of research yielded ideas that fed into later work:
1. How we are introduced to things makes a difference.
2. The rules governing interaction influence the outcomes.
3. We are drawn to things that are concealed or are the means of concealment e.g. containers.
4. Objects and artefacts afford different interactions, some of which may allow exploration and insight.
5. Consider all the senses when planning an interaction.
6. Be aware of participant satisfaction. A promise should be met, though not necessarily in the way that a participant expects. Be mindful of frustration.
7. Be kind.

4.4 Exploration 2: The ‘Magic’ Questionnaire (4 December 2007)

4.4.1 Description
A playful questionnaire was distributed to seventeen graduate students at a magic show. This questionnaire was intended as a way of harvesting conceptions of wonder for use in the design of the school intervention.

4.4.2 Planning
I was asked to present a magic show to my research methods group. I thought this was a good opportunity to ‘redesign’ the magic show in line with my vision of an event that provides surprises and revelations, but does not rely on deception or promulgate misconceptions, and considers the audience as participants, not spectators. Furthermore, I thought the show would be a way of collecting conceptions of wonder from participants.

I planned a simple programme. Inspired by the curiosity elicited by boxes expressed during the first exploration (see point 3 above), participants were to be asked to volunteer to open a number of boxes, each of which contained what I thought of as a ‘wonder’. For example, one box would contain a piece of antique conjuring apparatus, another would produce soap bubbles.

The questionnaire I designed for distribution was entitled ‘Box of Tricks’ (Figure 4). It combines hand- and line-drawings and bears a picture of a magic box and an anatomical illustration of a hand. It asks a number of questions of the respondents. The key question is ‘What does the word ‘wonder’ mean to you?’ I anticipated using answers as a potential source of illumination and a clue to future design. The other pursuits, which invite respondents to draw a self-portrait, list their likes and dislikes, imagine ten different
things they could fit in a pocket, and describe a magic trick they would like to perform were more than just a residue of past practice: I hoped this playful approach would stimulate participants’ creativity, and, perhaps, provide me with material for future projects – and future worksheets.

4.4.3 Acting

The show was an hour long. It went to plan, and the group of seventeen, beyond being ‘a lovely audience’ were amusing proactive participants. During the show I handed out six questionnaires. At the end of the show I announced that anyone present was welcome to take one. Three more were taken, resulting in nine questionnaires being distributed. A completed questionnaire is shown in Figure 4.
4.4.4 Observing

It is difficult to assess a show that has been performed for friendly colleagues. It was a supportive environment in which to perform, and the conversation afterwards was upbeat. An exchange of emails amongst the group following a participant’s sharing of her diary entry indicated a positive response and, amusingly, presented a question about methods:

‘Today my English coursemates threw a cream tea party...and they even brought the MagicMan back to do some tricks for us. And tricks, he did. He made so many of us broke wind right there in the classroom... And instead of caning or pulling the ears of those who did the unthinkable, MagicMan rewarded them! Now, which theoretical
framework did he follow? Whose tried and tested method did he use? Was it a new method?! But you know what, diary, it doesn’t matter what methods were used. If the desired result is achieved, and with great success, people will accept it and who knows, use this method in future parties’ (‘Sally’, email, 4 December 2007).

I thought this response was reward enough. As to the questionnaires, of the nine that were taken, five found their way back to me. They were completed with humour and playfulness befitting the playfulness of the artefact. The key question yielded a variety of responses:

What does the word ‘wonder’ mean to you?

1. ‘I wonder what it means to you?’
2. ‘When I say WONDER 2 things pop up in my mind. ‘Alice’ and ‘?’
3. ‘Astonishment. Surprise. The Unknown.’
4. ‘Something surprising or amazing, as in wonderland where the most ordinary things seems extraordinary. Also in the sense of epiphany, a moment of amazing, world-shattering, life-changing revelation.
5. ‘Watching a bee on a flower; rainbows; atoms; flight; clockwork.’

I was interested that the responses were so different. The first is playful, revealing little but for the licensed trickery that wonder might be associated with; two provides a literary reference; three gives words that are close to synonyms but, as considered in Chapter Two, reveal a wider dimension; four also provides synonyms and the same literary reference (Alice in Wonderland) but also indicates that the respondent associates wonder with profound change; five lists phenomena. Response four I took to be a useful cautionary note. Response five was to be the beginning of an ever-growing catalogue of wonders.

4.4.5 Reflecting

I learnt that a small sample could yield a variety of responses to a question about wonder. This in itself was encouraging. Of course, the context would have helped – a cheerful demonstration and an off-beat questionnaire. Nevertheless, it struck me as conformation that asking people about their wonder would generate material that was both insightful and useful for design.
4.5 Exploration 3: The Wonder Cupboard and Questionnaire (February 2008)

4.5.1 Description

The second questionnaire was designed to be collected and completed without requiring distribution by the researcher. As with the previous exploration, the questionnaire was designed to collect conceptions of wonder useful for the design of the school intervention.

4.5.2 Planning

I looked back at the Magic Show questionnaire. I was pleased by the variety of responses, and considered how it could be improved. I thought the content could be simplified to ask just the key question (‘What does wonder mean to you?’); I also thought there would be an advantage in having the questionnaires made available without being tied to a performance. I considered preparing the equivalent of a post box that could be left in a public space. The box would carry instructions for the completion of questionnaires which would be found inside the box. As an incentive, the instructions would announce a prize draw.

4.5.3 Acting

I acquired a small cupboard of oriental design from a Nottingham store. The cupboard had the virtues of having a small drawer large enough to hold questionnaires and pens, and a pair of hinged doors which could be locked, yet would allow completed questionnaires to be posted through them.

The questionnaire was a much simpler affair than the first. It asked only four questions: the respondent’s thoughts about wonder, the respondent’s name, the date, and a description of the weather. The last question I thought of as a ‘warm-up’ question; as a devotee of writing manuals, I had been lead to believe in the importance of keeping one’s pen moving (Brande 1934).

The instructions for use were affixed to the top of the cupboard. The cupboard was in place for two weeks in the corridor of the Learning Sciences Research Institute; I anticipated that respondents would be mainly members of the Institute, but felt nevertheless that it was wise to tap into the wisdom of my colleagues before extending the search.
4.5.4 Observing

Twenty questionnaires were completed. Four of them were typed, indicating that they had not been completed in situ. One of these examples (Figure 5), which begins ‘Now you’ve got me thinking’ I thought a good example of what McNiff and Whitehead call a ‘testimony’ of learning (2006, p.55), and an indication that a simple question can trigger positive contemplation. It is this positivity and range that permeates the entries: 19 respondents claim that wonder has positive aspects, invoking, for example, the ‘amazing intricacy’ of mosaics experienced when in holiday in Rome, the love of family, nature, and sunshine.

![EXPERIENCES OF WONDER?](image)

**Figure 5. The Wonder Cupboard Questionnaire**

Three responses offer particular insight into wonder’s role in exploration and learning:
'For me wonder is a chance to ponder uncharted possibilities behind a new idea or project. It is very much the sense of ‘possibility’ at the early stage of an idea which leaves me in a state of wonder.’

‘I see wonder as a revelation that leads to a process of exploration. This revelation could come in any sensual form – image, words, performance – but it must carry meaning that confronts the mundane and doesn’t just astonish but provokes self-questioning and enquiry.’

‘A moment of revelation, in which previously haphazard facts are seen to be related in some clear, logical way and a new potential for looking at the world is realised.’

Although each response is distinct (the first positions wonder at the beginning of a process, the last has wonder as the finale), for these respondents wonder is clearly a phenomenon with the potential for generating new understanding. They are consistent with the survey of the heritage presented in Chapter 2.

Finally, three responses offer words of caution:

‘Astonishment, something that surprises me and makes me think. But also a bit of ‘agony’: what if there is no answer to what I ‘wonder’ about? What if I get disappointed from what I find out?’

‘Wonder is something that can be easily dropped and ignored when other things carry on.’

‘Wonder goes at the end when you know the secret.’

I found these responses helpful reminders of the ‘dark side’ of wonder: for some the phenomenon is associated with potential discomfort, disappointment, inconsequentiality and evanescence. This sort of response was a reminder that a successful invention for wonder and learning would need to be kind, meaningful and supported sensitively.

To assist me in making sense of the data, I typed up the responses. I then printed out these responses and produced a batch of cards. These ‘cut ups’ were easy to consult and collate.

I spent time looking for differences and similarities, although I was concerned not to ‘collapse’ possibilities by producing a fixed system of categories.

4.5.5 Reflecting

Once again, I was struck by the efficacy of a simple intervention. Responses were varied and thought-provoking, offering insights into wonder as experienced and, more importantly, offering clues to the development of wonder-eliciting experiences.
My concern not to produce a rigid taxonomy of wonder was balanced by the need to come to understand the phenomenon as reported by individuals. The ‘cut-up’ approach was helpful here, allowing the arrangement and rearrangement of conceptions to prompt my thinking for future cycles of research and design.

After the event I saw that I had missed an opportunity. Given that I had found the responses such a stimulus to thought and imagination, I wished that I had found a way of allowing this data to be shared. For example, I thought that had I received permission from participants in advance, I could have made a display of the responses. This ‘wonder wall’ could have served as a locus of wondering and with the simple provision of blank cards, could have been a way of continuing to collect and grow ideas.

4.6 Exploration 4: The Conjurors’ Comments Book (22—24 February 2008)

4.6.1 Description

A book was circulated amongst conjurors at a convention for the recording of their thoughts about wonder.

4.6.2 Planning

I thought there was good sense in consulting conjurors, practitioners frequently associated with generating wonderment, to look for suggestions for design and phenomenon for incorporation in future work. An opportunity was to present itself in the form of the world’s largest magic gathering: the 56th Annual Convention of the Blackpool Magicians’ Club. Preparation was simple: I planned to take with me an exercise book in which to collect magicians’ thoughts. I anticipated a combination of interviews on the fly, and allowing the book to circulate during gatherings for attendees to write in.

4.6.3 Acting

At the beginning of the convention I passed the book around magicians known to me. On the first day I noted that 20 responses had been recorded. On the second day I passed the book around at the beginning of lectures, trusting that it would make its way back. During a break in the afternoon I took the book to the Dealers’ Hall and sought out professional practitioners who I thought would provide valuable insight, writing down their thoughts about wonder.

On the evening of the second day, the book, circulating during a lecture, failed to return to me.
4.6.4 Observing

I looked at the growing collection on the first night. I remember being surprised and delighted at some of the insights. Some magicians reflected on the difference between wonder, astonishment, and awe. Others proposed ‘recipes’ for wonder via sleights and devices. There were meditations on ingenuity, and a number of pages where magicians responded to a comment about the ‘wow factor’. I recall being pleasantly surprised that conjuring was not itself a source of wonder for one well-known conjuror. Instead, he cited the documentaries of David Attenborough, and singled out the roles of bacteria and fungi as decomposers, without which, he noted, the world would be buried in matter.

4.6.5 Reflecting

It is disappointing to report on a lost data set, particularly one that appeared to contain such variety and potential utility. I was led to conclude that a book of wonders is an attractive thing. It was a helpful reminder that a practitioner should be cautious to remain in control of his or her research instruments. Upon reflection, I see how an on-line forum would serve well as a way of allowing practitioners to share their thoughts, to agree, disagree, and elaborate. It would have the benefit of facilitating discussion over time and would be far more robust.

4.7 Exploration 5: The Street Interviews (March-June 2008)

4.7.1 Description

In a bid to collect from people of all ages, I took a clipboard to a street in Derbyshire, and sought individuals’ thoughts about wonder. As with each episode of reconnaissance, information collected was viewed as of potential use for the design and operation of the school intervention.

4.7.2 Planning

I was struck by the range of responses that the initial questionnaires had produced, even with a small sample. These questionnaires had yielded conceptions from academics; in order to further the work I needed a wider range of responses, particularly, given the trajectory of the design, the ideas of children. It seemed to me that a good approach would be to take to the streets to canvas people. After considering a number of approaches, including the setting up of a stall (a variation on the idea of an Information Bureau) I felt that simplicity would be the best starting point; elaborations could be allowed for later. As
a result of the theft of the note book used in the previous cycle, I was also cautious not to lose sight of my data. The result was the plan to take a survey to a local town, and to converse, collect, and see what unfolded. Rather than produce a questionnaire for completion, I produced a simple grid on which to record people’s conceptions of wonder. The grid had columns for the date, time, and participants’ thoughts.

### 4.7.3 Acting

This cycle consisted of a sequence of collecting ‘swoops’ on a main thoroughfare in Derbyshire. Between these acts, other opportunities arose – conversations that arose spontaneously with members of the public, and correspondence that I received as a result of my enquiries. Over 13 visits, 221 individual responses were collected using a simple gridded form.

I began the search on 5 March. I took a clipboard, pen and paper to a nearby town centre and positioned myself at a crossroads at the top of the High Street. I worked either a morning or afternoon shift, and ensured that I held sessions on different days of the week.

My approach was simple. My chief concern as a practitioner, rooted in my experience of street magic, was to avoid creating discomfort in individuals. I had seen people conducting surveys before, and observed the avoidance actions of passersby. I vowed not to become a nuisance by pursuing people or calling out, hoping instead that being friendly would work its charms.

I dressed smartly, wore my University card around my neck on a lanyard, and used a metallic clipboard with coloured paper. Often I found that people approached me, curious to know what I was doing. On other occasions I asked passersby if they would answer a single question for me. I introduced myself as a student at the University of Nottingham, and said that I was interested to find out how wonder could help us learn. I asked participants the question ‘What does wonder mean to you?’ and wrote down responses on the grid. I then invited participants to read what I had written, to check for clarity and to prompt additional thoughts. 221 responses were collected.

### 4.7.4 Observing

I found that people were keen to offer their ideas and memories; the fact that I had no hidden agenda or hard sell made it a pleasure to operate without stress. My objective of collecting people’s thoughts and remembered experiences was not a difficult task. I found that once an interested person had approached me and begun a conversation, others would
join in. On a number of occasions I attracted a crowd. I remember marvelling that this was like the tradition of ‘street magic’, but without tricks. Instead people were pooling their own ideas of the magical, strange, enlightening, delightful – all prompted by a simple question about wonder.

During the collecting I would occasionally scribble memos, but generally most of my thinking was put aside as I concentrated on getting down the thoughts of others. I learnt to ask the question and wait while the participant considered their answer, out loud or in silence. I then wrote down the response for the participant to read.

There were occasions when people would return to see me after they had been shopping, telling me they had been thinking and had come up with some new ‘wonders’. This struck me as a sign that asking people about their conceptions of wonder has the potential to initiate a positive and motivated enquiry in individuals. Twenty-three people expressed a wish to keep in touch with me, adding with a laugh that they wanted to take up my research, too. I provided these participants or ‘wonder-workers’ with my email address and the postal address of the Institute.

4.7.5 Reflecting

This was a very productive exploration. I amassed a lot of material in the form of survey documents (221 responses) and memos; after the event I received 27 letters and emails. It was clear to me that actively seeking wonder could result in a wealth of conceptions. My concern was to do this material justice and yield workable insights. The practice of constant comparison and contrast, beginning with immersion in data, enabled me to make sense of the varied written documents I was amassing (Wellington 2000). I returned to the cut-up technique that had helped me appreciate the responses for Exploration 3. I had the idea that it would be useful to ‘cut up’ further, by extracting from accounts single words and writing them upon cards. I thought of these cards as ‘seed cards’ which could be consulted, sorted, and considered.

The seed cards were the way I processed the data I collected as part of early cycles of research. I took words or descriptors from surveys into wonder, or participants’ accounts, and made a single card for each. These were small cards, 1”x1.5” that I cut using a crafter’s tool. The words were written in block capitals. I also prepared a digital set. These cards could be consulted, shuffled, and laid out on a table (analogue) or screen (digital), promoting or assisting, for example, connections between the phenomena of and
associations with wonder, reflection, sorting, and appreciating. Looking back, I think there is precedent in the idea of the conjuring design prompt, such as Fitzkee’s *Trick Brain* (1944). The cards helped me appreciate both the variety of phenomena encompassed by wonder, and of connections between them.

For example, George told me that he experienced wonder ‘that something is there’ and provided a number of examples:

‘Beauty in nature – mountains, lakes, canyons, anything of scenic beauty.’

‘Seeing the changes in scenery during a walk/ride (or over time).’

‘Natural phenomena (e.g. ants crawling in a long line or birds building nests).’

This response yielded the following seed cards:

<table>
<thead>
<tr>
<th>Beauty</th>
<th>Nature</th>
<th>Mountains</th>
<th>Lakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canyons</td>
<td>Scenery</td>
<td>Seeing</td>
<td>Changes</td>
</tr>
<tr>
<td>Walk</td>
<td>Ride</td>
<td>Time</td>
<td>Natural Phenomena</td>
</tr>
<tr>
<td>Ants</td>
<td>Birds</td>
<td>Nests</td>
<td></td>
</tr>
</tbody>
</table>

Although this approach risked the loss of some information, by mixing these cards and sorting them I could look for similarities and differences, and consider taxonomies for wonder. It occurred to me that an arrangement of ‘seed cards’ resulted in a ‘seed tray’, a representation from which new ideas could be grown.

In the analysis, several useful insights emerged, in particular the idea of *materia medica*, phases, dimensions, and design tenets. Firstly, I came to the realisation that I was creating a Cabinet of Curiosities based on what people told me they felt wonder for, or wondered about. This was a list of items which continued to expand throughout (and beyond) the study, a collection that included avocados and Avogadro numbers, zeedonks and zygotes. I thought of this as *materia medica*; objects, artefacts, and experiences that are a stimulus to wonder and wondering, governed by subjective experience. I realised that people might describe wonder for different reasons, for example, a butterfly might afford wonder at its colouration, or at the process of metamorphosis it embodies. And although I occasionally found myself considering that there was a qualitative difference between an aesthetic and
an ontological response, I came to realise that it was the moment of wonderment that was key. From a moment of connection, many things could happen. An appreciation of a butterfly’s wing could lead to questions, continued delight, a desire to know more. Perhaps the responsibility of the practitioner-as-designer is to allow for this expansion, without forcing.

Secondly, I discerned four ‘phases’ of wonder(ing) in what people told me:

- Anticipation: a sense that something is going to happen, and a desire to know more.
- Encounter: the moment of experiencing the wondrous
- Investigation: the pursuit of the wondrous in order to understand it better or to continue the experience.
- Discovery: something is discovered, even if the discovery is an awareness of unknowing.

The anticipatory phase was not something that had emerged from a survey of the literature. I collected 57 conceptions of wonder that could be categorized in this way, such as:

‘It’s when you know there’s something round the corner, but you don’t quite know what it is.’

‘Something good and mysterious, and more mysterious ‘cos you know it’s there but you don’t know what it is.’

‘It’s the expectation of something unusual happening.’

‘Wonder’s partly when you have a feeling that something odd is on its way.’

The fact that this was a new phase, and a positive one, struck me as a valuable finding, and one of potential significance for the design of educational wonder experiences.

Thirdly, I saw in both the materia medica and the phases a number of emerging characteristics which would be useful in the design of an invention for wonder and learning. I came to think of these tenets as ‘dimensions’ of the wondrous (Table 4). This resulted in a simple checklist that I could apply to objects, artefacts, and the experiences within which the objects and artefacts are situated.

For example, when people describe an object, artefact, or experience that they conceive of as wondrous, they often describe the quality of novelty (‘It’s something new and you want to know more.’). This spans complete novelty for the participant (‘It’s something you’ve never seen before’) to partial novelty e.g. an object containing a new element (‘I saw a
butterfly but it had a green body’). Thus to assist in the provision of wonder for others, where possible the novelty of an object, artefact, or experience should be considered.

The main dimensions that provided my checklist for design are presented below in Table 4:

Table 4. Dimensions of Wonder

<table>
<thead>
<tr>
<th>Dimension</th>
<th>How expressed in object, artefact or experience</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novelty</td>
<td>Something new, or containing elements of the new, or experienced as if new</td>
<td>An exotic plant</td>
</tr>
<tr>
<td>Mystery</td>
<td>Not knowing what something is, or not knowing what will happen</td>
<td>A veiled form</td>
</tr>
<tr>
<td>Surprise</td>
<td>Sudden apparition, unexpected appearance, or unusual context</td>
<td>A fried egg in a field</td>
</tr>
<tr>
<td>Status</td>
<td>Value expressed in its positioning or apparent quality</td>
<td>A jewel in a case</td>
</tr>
<tr>
<td>Meaning</td>
<td>Perceivable connection or relevance to observer or to others</td>
<td>An open book</td>
</tr>
<tr>
<td>Interaction</td>
<td>Suggests possibility of approach and further examination.</td>
<td>A red button on a wall</td>
</tr>
</tbody>
</table>

Although it was helpful to separate out the dimensions, it struck me that there are multiple connections between them. Thus ‘status’, the suggestion that something has value or importance signalled, for example, by its aesthetic appeal or its positioning, connects to the perceivable ‘meaning’ or meaningfulness of an item or the experience. The ‘mystery’ of an artefact (for example, by having it partly or fully concealed via a covering) can also contribute to the ‘novelty’ of a situation. I resolved not to be anxious about the taxonomy – but the dimensions seemed a helpful and sufficient checklist which would assist in design and operation of the wonder intervention.

A shortcoming of this cycle was the fact that children’s voices were lacking: I had collected only 26 responses. Although I was not producing a study of the differences between children’s and adults’ conceptions of wonder, I felt it would be helpful to have an understanding of children’s ideas in order to work with them in the design for the
school invention. I resolved to continue the quest by planning for another cycle of ‘street wondering’ later in the year.


4.8.1 Description

An interactive stall about the wonders of the element carbon was designed for a major science communication event.

Figure 6. Wonder in Carbonland

4.8.2 Planning

I was invited to work with a team of ten scientists from the Universities of Nottingham and Oxford to produce an interactive stall for the Royal Society Summer Exhibition celebrating carbon and its properties and potential uses. I suggested that the ‘wonders’ of the element would be a good way in, and proposed the title ‘Wonder in Carbon Land’. Over several months I worked with the team to produce an inviting and educational exhibit that would make clear the ‘wonders’ of the element.
I considered this, in part, an opportunity to try tenets for design that had been derived from the ongoing literature reviews and street interviews. Of particular use was the checklist of ‘dimensions’ for design as recounted above. I also anticipated that this would be another opportunity to seek conceptions of wonder from individuals. After rejecting the idea of distributing questionnaires or worksheets, I elected to be opportunistic; the event would afford conversations with visitors, during which I could make notes of novel ideas. I would also be in a position to observe the reactions and interactions of visitors/participants, thus potentially deriving insight into the successes or shortcomings of the design tenets.

Table 5. Dimensions of Wonder as Expressed in Wonder in Carbonland

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Ways of Expressing in Display</th>
<th>Examples of Exhibits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novelty</td>
<td>Creating striking ways of representing carbon</td>
<td>Large origami models</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thaumatropes to demonstrate carbon encapsulation</td>
</tr>
<tr>
<td>Mystery</td>
<td>Producing exhibits that suggest affordance but do not reveal their action until examined</td>
<td>Van der Vaals model</td>
</tr>
<tr>
<td>Surprise</td>
<td>Revealing the unexpected and counterintuitive nature of carbon</td>
<td>Array of allotropes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quantum Cups and Balls</td>
</tr>
<tr>
<td>Status</td>
<td>Producing quality models and materials</td>
<td>Illuminated stand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Podia</td>
</tr>
<tr>
<td>Meaning</td>
<td>Connecting the demonstrations to the lived world e.g. the significance of carbon for future computing</td>
<td>Quantum computing animation</td>
</tr>
<tr>
<td>Interaction</td>
<td>Ensuring visitors have opportunities to explore, especially through provision of interactive models and demonstrations</td>
<td>Sphere packing tubes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conductivity machine</td>
</tr>
</tbody>
</table>
Planning, designing, and manufacture took five months. Members of the team designed origami kits that assembled into models of C60 (Buckminsterfullerene); others designed demonstrations showing the conductivity of different forms of carbon. Members of the group calculated how many carbon atoms there are in the ‘lead’ of a standard pencil. We had a pencil made which was emblazoned with the legend ‘80000000000000000000000 carbon atoms’.

My chief role was to consider communication of ideas via conjuring. I worked with a consultant and his team to produce two conjuring demonstrations which described the counterintuitive action of quanta. I adopted the ancient conjuring routine of the Cups and Balls to demonstrate the phenomena of quantum tunnelling. This was filmed, with explanatory subtitles, so that it could be shown on a screen at the stall. I also modified and routined Histed’s ‘Prayer Stick’ prop (Histed 1947) to represent the phenomenon of quantum entanglement.

I also worked with a colleague to produce thaumatrope ('wonder turners'). The thaumatrope, first described by John Paris (1827) is an optical toy consisting of a threaded disk which, when spun, produces a fusion of the two images on its two sides. We adapted them to represent a number of quantum-related phenomena, e.g. the encapsulation of carbon molecules in graphene tubes.

With the intention of building on the experience, we set up a website which provided materials for teachers to assist them in the teaching of the subject of nanoscience, publicised via the handouts and artefacts we distributed (www.nottingham.ac.uk/nanocarbon).

4.8.3 Acting

The stall ran for four days. The Royal Society estimated that 4,323 people visited the exhibition, with a range of ages, from primary school children to senior citizens. Visitors were welcomed into the space and were allowed to roam, observe, and ask questions. Our role as docents was to provide demonstrations, encourage interaction, and facilitate understanding. One might also consider that our role was to ‘spread the wonder’.

4.8.4 Observing

It was clear that the space was inviting; many visitors mentioned this when approaching us. It was designed to appeal to the old and young, through its variety and its multiple expressions of the dimensions of wonder. The very young were drawn to the models
which invited them to stack spheres and explore magnetic attraction; they may not have connected to the ideas underlying the models (the self-assembly of carbon spheres in nanotubes; the action of Van der Vaal’s forces) but these moments may have served as a potential reference point. I had numerous conversations during the four days, and witnessed many ‘wows’ from visitors.

4.8.5 Reflecting

The subject we worked with clearly had great potential for inducing wonder in an inquirer. The guidance provided by the idea of dimensions yielded by the earlier explorations assisted in making decisions about the contents of the exhibition and their production. Furthermore, the care taken over the materials and the overall experience contributed to this promulgation of wonder and learning. I saw again the helpfulness of apparatus with which to appeal and to confer an experience. It was also a pleasure to work as a team, and I saw how planning and constructing with others could be productive and pleasurable.

We received many positive comments about the stall, a number of which were expressions of wonder. It was regrettable that we had elected not to produce a guest book. Feedback would have proven potentially helpful for future iteration.

4.9 Exploration 7: Street Interviews 2 (August—September 2008)

4.9.1 Description

I returned to the High Street to collect more conceptions of wonder, as with Exploration 5.

4.9.2 Planning

I considered my last turn as street mountebank. I had collected 221 responses from individuals. Twenty-three strangers had asked to keep in touch and had proven co-wonderers. For the second cycle, I intended to repeat the experience. I thought that a designed sheet for the clipboard would assist me. I also hoped to collect more responses from children, anticipating that this would prove useful for the design of the school invention.

4.9.3 Acting

On twelve occasions I returned to the town in Derbyshire. Circumstances also took me to Essex, and allowed me three days on a new high street. As before, it was a matter of
positioning myself in a busy thoroughfare with a clipboard, and approaching pedestrians kindly.

4.9.4 Observing

As with the previous exploration, this was a positive experience which yielded a variety of material. I collected 317 responses. People’s ideas of wonder were consistent with those I had collected before, but during the search I realised the need for an expansion of taxonomy. I could still discern the four phases of wonder I had classified as: anticipation (e.g. ‘You know something’s going to happen and you want to know what’); encounter (e.g. ‘You come into contact with something that makes you go ‘wow’’); investigation (e.g. ‘You need to know more’); and discovery (e.g. ‘You realise you’d never known that raindrops are spherical’). However, by the time of this cycle, I was keen to establish a description of these phases from the point of view of a designer of wonder. That is to say, ‘anticipation’ cannot be relied on simply to happen: it needs to be assisted in the first instance. In considering what needed to be done in order to facilitate wonder for learning, I came to see a further four phases that could prove valuable to an educational intervention. These additional phases are:

- Developing: helping participants to work with their discoveries;
- Manifesting (from the Latin for ‘hand striking’): making learning visible in the form of exhibits, à la Cabinets of Curiosities;
- Celebrating: sharing findings joyously;
- Propagating: encouraging growth and development beyond expectation.

These phases seemed to me to be both pedagogically sound as well as consistent with what I had learnt from the exploratory research. I thought of the difference between ‘surface wonder’, which might involve marvelling at something but not pursuing it for greater understanding, and ‘deep wonder’ which leads to a need to know more. However, several conversations helped me see that there could be meaning for people in choosing to relish mystery. This was the case for one man in his appreciation of conjuring: not wanting to know the ‘secret’ preserved the ‘magic’ for him. It occurred to me that this was predicated on his knowledge that there was a method to be explored if wished. Thus for this man, positive affect can be derived from suspension of knowledge. Perhaps a system for wonder and learning could offer the opportunity to enjoy both knowing and
not-knowing. This would certainly fit with the wide range of ‘wonders’ that people continued to evoke.

The chief expansion came from the growing number of things that people told me they wondered about or felt wonder for. For example, one man told me of his ‘hobby’ of ‘stealing yawns’ from people, and how yawning was in itself a strange and, he presumed, important phenomenon. Several people joined in the conversation and we all marvelled at the fact that we could not help but trigger yawning in one another. There was a consensus that none of us knew enough about the mechanisms of yawning, and there was a vow to learn more.

I continued to talk with children about the wonder, and felt that although adults have a wider range of experience and vocabulary, the young often had clear and sophisticated ideas about wonder:

‘I feel wonder when I look at my collection of fossils. I wonder how old they are, and what lives they had, and how they became extinct.’ (Frank, age 9)

‘Wonder is when you go ‘wow’ at something and then want to know more.’ (David, age 9)

‘Wonder is something you find when you are curious about something, like how birds fly. It is a nice feeling.’ (Shannon, age 10)

Leanne, a girl of five, told me wonder was ‘fun’ but was stuck for words. I asked her if she could think of something that made her feel wonder. She told me:

‘I sometimes get things that I think are brilliant and stuff... Last Christmas I got an easel... [I asked why it was wonderful]... On one side you can paint, on one side you can draw with chalks. You don’t just have to paint, you can actually use chalks as well. Drawing and painting is brilliant.’

Clearly Leanne associated the word wonder with positive experiences. I thought that her example indicated that a ‘wonderful thing’ affords a positive creative experience and, in its transformation from chalk board to painting surface, allowed more than one type of experience.

I marvelled at peoples’ ideas and, on another level, at how a simple question (‘What does wonder mean to you?’) had led to such a wealth of thoughts and initiative. It was around this time that I realised that a direct question should be at the core of an invention for
wonder and learning; I could think of no other way to yield such positive variety while tapping into individuals’ sense of meaning.

4.9.5 Reflecting

My field notes suggest that I continued to enjoy the experience of the search with others:

In the collecting of individual ideas of wonder there is the key feature of bringing to awareness. I have noticed that on a number of occasions that people are both visibly surprised (e.g. startled) and intrigued (e.g. questioning) by being asked to consider wonder. They wonder freshly on the spot. It is a privilege to watch someone light upon an idea, or past experience, or vision of wonder, and to hear them express their wonders. Some people tell me they had not singled out their thoughts about wonder before, and by doing so they realised what they had forgotten to notice. Another ‘kick’ to this new awareness is that people sometimes return, seeking me out to say that more wonders have occurred to them. Today a man came back to tell me what he knew about the behaviour of earwigs, and how much care the females took of their eggs and babies. A woman came back to tell me she had called her daughter to ask her about her thoughts. These were snowflakes and the birth of her daughter. I was, again, impressed that a participant had taken it upon herself to become a researcher. (5 September 2008)

Did the second cycle of collecting advance the research? It certainly increased the amount of data I had to work with, but this was energising rather than defeating. What I found was consistent with earlier searches; the difference was in the examples of the wondrous people provided. I took this as a sign that the exploratory spiral was coming to an end: an instance of ‘knowing when to stop’ in data collection (Wellington 2000).

I had the opportunity to talk to 30 children about wonder. Again, I found that children were often eloquent in their expression of wonder, although they would often be prompted by the adults that accompanied them. The upshot was that I felt confident that asking children to consider their ideas about wonder would not present a difficulty in a future intervention. An advantage of working in a school would be that children would have the opportunity to consider their ideas without being influenced by an adult which, I anticipated, could make the experience more meaningful for the child.
4.10 Exploration 8: LSRI Launch Event: ‘Cabinet of Learning Curiosities’ and ‘Seed Labyrinth’, 7 November 2008

4.10.1 Description

For the official launch of the LSRI, I produced two wonder and learning inspired interactive exhibits: a Cabinet of Learning Curiosities, displaying instructional devices ancient and modern; and a labyrinth made from seeds (Figure 7 and Figure 8).

Figure 7. The Seed Labyrinth
4.10.2 Planning

I was asked to produce ‘a buzz’ in the main atrium of the building which houses the LSRI, as part of its official launch. Clearly, it would be important to consider the theme of learning across time and disciplines, as well as inviting interaction and conversation.

First I considered space. Two areas were suggested as ideal for development: a large expanse of floor space in the atrium of the building that housed the Institute; and the landing that led to the Institute’s main corridor.

Given the lively and informative conversations sparked by the Magic Table (Exploration 1) I felt an array of objects and artefacts associated with learning and education would provide a useful focus of attention and exchange of ideas. The Institute invested in three glass display cabinets that could be placed by the entrance to the LSRI, a space that would also provide a view of the labyrinth in the space below, thus linking the two exhibits.

First I took stock of items I had in my possession that were conceivably wondrous, particularly in line with the dimensions. These included mechanical puzzles (a bilboquet or ‘cup-and-ball’ once touted as aid to dexterity), mathematical tools, and optical devices. I also assembled a smaller cabinet of curiosities to sit within one of the cases (see Figure 8). Members of the LSRI were invited to contribute items: these included a slide rule, a ZX80 Spectrum home computer, and a khipu.
I produced a list of the objects and artefacts and from this produced a handout with questionnaire (Figure 9). This checklist allowed participants to ‘spot’ the contents of the cabinets, as well as provide suggestions as to what was missing. These questionnaires would be distributed by a colleague who agreed to act as docent to the display.

![THE LSRI CABINET OF LEARNING CURIOSITIES](image)

**Figure 9. Cabinet of Learning Curiosities Handout**

I planned the construction of the labyrinth in the atrium. This, I felt, would be the chance for participants to experience an ancient ‘learning space’. As host of this space, I anticipated having potentially illuminating conversations with visitors about the
experience of walking a labyrinth, the ‘wondrous’ dimensions of labyrinths, and the ideas informing my research.

I had constructed labyrinths before using materials such as rocks and rope. The chief puzzle was how to produce a temporary but robust labyrinth that fitted the space. After trialling several materials including gravel and sand, I elected to use black sunflower seeds. These had several advantages in that they were pleasant to work with, easy to manipulate, and would provide food for birds after the event.

4.10.3 Acting

The labyrinth took five hours to make and required 60 kilograms of seeds. This was carried out the night before, when the building was closed. I was assisted by a colleague and friend from the LSRI who knew that cups of tea and encouragement are of great help in the construction of venerable learning spaces.

I assembled the cabinets on the morning of the event. As with the Magic Table, I sorted and arranged the exhibits according to categories that suggested themselves. Thus there was a shelf devoted to models, another devoted to computers, and another devoted to writing. I elected not to provide a key to these arrangements, preferring to let visitors consider the connections.

During the event, I positioned myself at the entrance to the labyrinth. Visitors were booked in for an allotted time slot by a colleague who was positioned near the entrance to the building. My colleague and co-curator was positioned at the cabinets and was briefed to be welcoming, hand out questionnaires, and enjoy the interaction.

4.10.4 Observing

The Seed Labyrinth: When I arrived on campus on the morning of the event, it was clear that the labyrinth had already succeeded in causing a ‘buzz’. There were large crowds surrounding the labyrinth, which had been cordoned off since I had left it. I overheard conversations between pupils and staff about what it was and how it came to be there. One student turned to me and said ‘It’s beautiful, like it’s been put there by aliens.’ I chose not to tell him that I had built it, preferring to be present as an anonymous observer. I thought this was not unlike the conjuror’s technique of not ‘stepping on the moment’ (Harris 1992). Throughout the day the labyrinth continued to garner attention; as I set up the cabinets on the landing above I witnessed a constant throng of visitors with cameras,
and could see that it prompted discussion. Remarkably, I saw no one attempt to cross the cordons to examine the structure.

Later while ‘hosting’ the labyrinth I had the opportunity to share ideas with academics from many disciplines. There were 25 timed slots for visitors who wished to walk to the centre of the labyrinth and back. Conversations were varied and stimulating: a mathematician was surprised to know that this ‘organic’ shape is derived from an algorithm; a computer programmer pondered the design of a labyrinth application; a teacher asked me about how labyrinths have been used in the past. Perhaps most interesting of all was to listen to accounts of participants who had walked the circuit of the labyrinth. Everyone attested that the walk had proved to be more than they expected, and I collected some accounts on note cards:

‘I felt that I was ‘out of it’, in a space separate from the world outside.’

‘It made me quite mindful, partly because I was careful not to step on the seeds, but something else, like I was in my own little zone.’

‘It made me feel dizzy. Even though it is a small space, the path seems to be a long way to the centre.’

In all cases, the experience of a labyrinth afforded the opportunity to consider theories of how the walking of a simple unicursal path can generate unanticipated sensations.

**The Cabinet of Learning Curiosities:** As I ‘worked the floor’ of the labyrinth, I was unable to observe people at the cabinets. My co-curator acted as docent to the collection. She reported that there had been a number of exchanges, often tinged with nostalgia. Several questions came down to me via people acting as messengers. I would listen to the question, give a considered answer – or none if I were uncertain, and watched the messenger-participant deliver a response to the questioner at the cabinet. I made a note of the questions that arose:

‘What is a bilboquet?’

‘Is the Mystery Item a sea urchin’s mouth?’

‘What is the thing that spins round?’

The first two of these questions had evidently been prompted by the handouts. My co-curator reported that forty handouts had been taken away, but only six had been
completed. Respondents circled a range of items to indicate appeal. Three respondents thought the displays were lacking the presence of living things.

4.10.5 Reflecting

The Seed Labyrinth was a pleasure to construct, a refreshing opportunity to make a large artefact and to honour a tradition. I think I missed an opportunity in not producing an information board for visitors – even a few facts about labyrinths would have been a chance to share information about a tradition and, perhaps, promote further interest and investigation. Nevertheless, I thought the fact that at the beginning of the day a multitude of visitors wondered aloud, expressed aesthetic appreciation and took photographs was a sign that the installation had the ‘wow factor’. Later, when I had the opportunity to share ideas with visitors, I thought of the labyrinth as a genial learning space which allowed for a number of conversations to take place.

The Cabinet of Learning Curiosities: I wished I had been able to be present at the exhibit to join in any conversations that were occurring. Although my colleague was a friendly presence, she told me after the event that she did not always know how to engage visitors, perhaps, she confessed, because she had not felt like an authority on all the objects and artefacts on display. I could have assisted here with a more thorough briefing, or through the design of more thorough supporting materials. There was also the issue of accessibility. Exhibits were presented in locked cases: Blackpool had taught me to be wary of being too relaxed with ones’ apparatus. An open cabinet would have allowed a closer interaction but would have required a different approach.

4.11 Between Cycles: Presenting Wonders

From July 2008 onwards, I made the most of opportunities to present my research to peers and a wider audience. Presentations and workshops were a mixed bag, including: Quantum Information Processing Research Centre: ‘Quantum Effects: Conjuring, Learning, and Curiosity’ (4 July); Cambridge Festival of Ideas: ‘Nanoworlds’ (with Dr Lizzie Burns) (25 October); University of Education Postgraduate Research Conference: ‘Weaving the Threads of Educational Research’ (19 November). More than just an opportunity to disseminate research, I saw these events as an opportunity to try out ideas and collect feedback, and although not research cycles, they were subject to the stages of planning-acting-observing-reflecting. One of the advantages of presenting work to different audiences was the requirement of creating descriptions of the phenomenon of
wonder. I described the exploratory research, provided ‘whistle-stop tours’ of the heritage, and invited audiences to share their ideas about wonder and learning. To this end, I put together what I thought of as a number of ‘chimaeras’: descriptions and visualisations which, although not exhaustive, were inclusive of many of the ideas of wonder I had encountered (Figure 10).

Figure 10. Representing Wonder's 'Dimensions'

Figure 10 depicts multiple paths or ‘ways’ which lead to connected arenas of experience. In this model, at the centre of the experience is a ‘wondrous’ object or artefact which has the dimensions of, for example, novelty, mystery, and status. Although far from a perfect representation of the phenomenon of wonder, visualisations such as this allowed me to share my thoughts about wonder experiences and invite discussion and feedback.

4.12 Summary of the Reconnaissance

Much emerged from the exploratory research. I often found myself reflecting that research into wonder was itself ‘wonderful’ – not just full of the collected wonders of others, but in itself able to generate wonder in the researcher and participants.
The cycles advanced my learning journey in many ways. Below are some of the key points I took from them. I have presented a positive and a negative for each.
<table>
<thead>
<tr>
<th>Cycle</th>
<th>Title</th>
<th>Positives</th>
<th>Negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Magic Table</td>
<td>Objects and artefacts afford exploration and conversation about wonder.</td>
<td>Take no risks with surprise: kindness is paramount.</td>
</tr>
<tr>
<td>2</td>
<td>The Magic Show Questionnaire</td>
<td>Conjuring shows can generate positive affect and can be adapted beyond trickery to encourage the sharing of ideas.</td>
<td>Sample widely.</td>
</tr>
<tr>
<td>3</td>
<td>The Wonder Cupboard and Questionnaire</td>
<td>When people are asked to reflect on wonder they produce varied and thoughtful responses which attest to the value of the enquiry.</td>
<td>Consider how ‘wondrous’ data can be shared with participants.</td>
</tr>
<tr>
<td>4</td>
<td>The Conjuror’s Comments Book</td>
<td>Conjurors hold multiple views of wonder.</td>
<td>A compendium of wonders is an appealing thing: do not let your data or apparatus get stolen.</td>
</tr>
<tr>
<td>5 &amp; 7</td>
<td>Street Interviews</td>
<td>People enjoy considering wonder. Some people are prompted to become seekers of wonder when asked to consider wonder.</td>
<td>Know when to stop.</td>
</tr>
<tr>
<td>6</td>
<td>‘Wonder in Carbonland’</td>
<td>An interactive and diverse display of exhibits can be created for wonder and learning.</td>
<td>Wherever possible, collect feedback.</td>
</tr>
<tr>
<td>8</td>
<td>Cabinet of Learning Curiosities</td>
<td>Wonder can include an element of nostalgia.</td>
<td>Ensure docents/curators are fully briefed about the exhibits they are sharing. Hands-off experiences are</td>
</tr>
</tbody>
</table>
As well as these insights, from the wealth of data arose ideas that helped with research and design. I came to see that people experience wonder in a multitude of ways, ways positive and helpful and of significance for educational experiences:

- People attest to wonder having cognitive, affective, and exploratory dimensions.
- Wondrous experiences can be considered as having four phases: anticipation, encounter, investigation, and discovery. For the design of wonder learning experiences a further four phases are desirable: development, manifestation, celebration, and propagation.
- Wondrous objects, artefacts, and experiences have dimensions that can be identified and mobilised for the purpose of design.

I saw the power of a simple, direct question (‘What does wonder mean to you?’) to not only yield insight into the phenomena and suggestions for design but to generate continued engagement and unplanned bonuses, such as participants returning with more ideas. I came to think of this as part of the propagative model of wonder, mindful of Bacon’s ‘wonder is the seed of knowledge’ (Bacon 1605/1905). I also saw the importance of the design of experiences which, inspired by conceptions or heritages of wonder (e.g. a display of wondrous artefacts) would allow participants to explore and to contribute their own thoughts about the phenomenon.

By the end of this first research spiral, as I anticipated and planned the invention for use in a school, I could identify three goals for realisation:

1. An invention for wonder and learning should be wondrous. In other words, it should itself be characterised by the experience of wonder: participants should be assisted to feel wonder (e.g. experience ‘wows’) and to wonder about entities (e.g. questioning)
2. An invention for wonder and learning should be **constructive**. It should allow participants to express and share their ideas of wonder with others, via the construction of artefacts and experiences.

3. An invention for wonder and learning should be **propagative**. It should be allowed to grow beyond initial frameworks via encouraging participants’ initiatives.

The next cycle of research would see me talking to teachers about the possibilities of creating a wonder invention, drawing upon the things that I had learnt in the reconnaissance, and running this invention in a primary school. This would be followed by an attempt to package and share this invention so that it could be run by teachers in other schools. This spiral is the subject of the chapters that follow.
Chapter Five: The Wonder Box System: A Primary Intervention

‘I don’t think anyone will dispute that we need wonder in our schools. The golden question is: how do we make it happen?’ (Interview with head teacher, March 2009)

5.1 Introduction

The Wonder Box system, which took shape as the exploratory research progressed, was created with the intention of assisting in the generation and exploration of wonder as an educational experience in a classroom environment. It was the manifestation of the second research question: ‘How can we mobilize the heritage of wonder and the insights of the living for the design of wondrous experiences in school settings?’ It was fashioned to be run in a primary school in Nottingham, involving initially a combined class of Year 5 and Year 6 pupils (21 pupils, 9 to 11 years old), expanding to involve the entire year group (74 pupils, in 3 classes) and growing to involve the whole school. It ran for several months – a launch event, followed by pursuits both inside and outside the school, culminating in a wonder and learning ‘happening’. Inspired by many sources (as described in Chapters Two and Four), it had a structure – afforded by the pursuits ‘packaged’ in the boxes themselves— which was designed to allow for progression, but also for adaptation to multiplicity. The system generated a wealth of constructions, compositions, documents, artefacts, manifestations, all of which it was hoped would offer useful data and resources for both the understanding of conceptions of wonder and for the refinement and development of the system. Most importantly, the boxes were designed to bring participants to experiences of wonder, wonders, and wondering via their own and others’ conceptions and explorations.

It was envisioned that all modules or ‘Boxes’ would share goals. Each would provide an opportunity for participants to experience the sort of wonder evinced by both the literatures and the exploratory research: both cognitive wonder (wondering about, wondering how, wondering if etc.) and affective wonder (feeling a combination of characteristics such as surprise and delight in the pursuit of understanding), and to share and celebrate these experiences. Furthermore, there was the goal that these experiences would not be limited or limiting, but would open out into self-motivated continued exploration for the participants, the ‘propagation’ identified in the reconnaissance work.
5.2 Planning a Wonder Intervention

From the very beginning of this research project, one of the wishes had been to design an intervention – or ‘invention’ – that could operate in a formal learning environment. I anticipated that this might best be met by the design of a kit inspired and informed by my practice and research that, in the first instance, I could run myself, with an eye on iteration and simplification for transmission to other teachers. The intervention grew from my experiences as a practitioner meeting insights from both the literatures and the exploratory research, shaped by the realities of locating a school that could enable the running of such an intervention.

5.2.1 Envisioning a Wonder Intervention

In the early stages of research, as I carried out the exploratory work described in Chapter Four, I generated a number of visualisations of what an intervention for wonder and learning would look (or feel) like based on insights that came from the heritage and reconnaissance. These insights included the ideas that emerged from the Magic Table (cf. 4.3.5), the concepts of dimensions and stages, and *materia medica*. Many of these visualisations, described below, featured boxes which held ‘wonder materials’, suggested by the tradition of conjurors’ apparatus, as well as meeting the conception of wonder as mystery and surprise, and, furthermore, serving the practical need of containing or packaging wonder-elicitors. I felt it would be fitting to mobilise traditions of wonder (e.g. Cabinets of Curiosities, conjuring, direct enquiry into wonder) by meaningfully packaging and sequencing them. The working tenets that arose from both the explorations and the literatures offered guidelines and instantiations for the growing intervention. Thus, for example, I felt that any wonder-based pursuit would benefit from a structure that began with anticipation and led to shared manifestations. Thus, as will be further considered, the reconnaissance informed the primary study.

5.2.2 Seeking Teachers’ Ideas

Most important of all was the consultation of others. My research brought me into contact with a number of professionals working in formal and informal education. Connections came through colleagues at the University, through communications sent to recommended people, and through serendipity. Conversing with practitioners was an excellent way of discovering desirable qualities for the intervention – the materials (instructions and ‘props’), the outcomes, and practicalities.
I met with three teachers, one head teacher, and a learning assistant for informal conversations on five separate occasions. They each bemoaned the blocks to the pursuit of wonder in school: a restricting curriculum, assessment, and the many requirements that a school day demands. It was clear that if an intervention for wonder were to be successful it would need to work in the spaces in-between of a school day and term, not prove taxing on teachers’ time, and have a helpful relationship to the curriculum. Two teachers thought there was an interesting contradiction in the requirement of ‘awe and wonder’ (see Chapter Two) in the face of lack of guidance and lack of time.

The foremost consideration was therefore pragmatic. The intervention needed to be practical. The teaching assistant suggested that I think of teachers as ‘grumpy, with very little time to read complicated instructions’. An ideal intervention would be easy to pick up and operate. One teacher thought the format of a lesson plan would be useful; two teachers and the learning assistant counselled against this:

‘It would be nice to have something different, you know, not the standard boring thing. Perhaps you can find another way of relaying instructions.’

‘Do something different. We could do with it. Just make sure it’s not a hassle to put on.’

‘If it looks like another scheme of work you’ll just end up with cookie-cutter stuff.’

These discussions lead to multiple blueprints of boxes and their activities, including reports, visualisations and working scripts, considered and critiqued by my supervisors and colleagues. From these designs, a working sequence was prepared. Given that in the first instance it would be myself running the intervention, I produced materials that I was accustomed to working with according to my magician’s practice – a working script with step by step instructions. When it came to disseminating the materials, I could reconsider these materials.

The design would remain unfixed until I had made contact with a teacher willing to offer me the time and space in which to run the intervention.

5.2.3 Planning with a Teacher

A primary school, Rabbit Island in Nottinghamshire, was found by recommendation through a practitioner colleague. I met with teachers and described my work to date, and wishes for the intervention. A teacher of a combined Year 5/6 class, Mr Oak, offered ten sessions, morning or afternoon, between the SATs examinations and the summer holidays
(June to July 2009) with the possibility of a ‘launch event’ in March. Free reign was given, but we agreed that at least one field trip would be both a treat and an opportunity to explore ideas of wonder.

A number of requirements, consistent with those voiced by other teachers, arose:

- Differentiation. The research and pursuits should be accessible to and appeal to all – boys and girls in a mixed-ability class spanning two year groups (Year 5 and Year 6) (i.e. 9-11 year olds)
- Activities should be engaging, drawing in pupils who might be shy or initially reluctant to take part
- Flexible: be prepared for changes of plan: e.g. cancellation, sickness
- Assist in the teaching of difficult subjects
- Practical (easy to use, inexpensive)

These requirements were considered realistic, sympathetic to the exploratory work described in Chapter Four. They are considered in the account of the intervention below, and given further thought in Chapter Six.

5.2.4 The Structuring of the Intervention

The phases of wonder for learning as identified in the exploratory research proved a helpful template for structuring possible pursuits to be included in the intervention. In the context of the intervention the eight structuring phases identified were:

- Anticipating: establishing a desire to find out via intrigue;
- Experiencing: delivering prepared encounters with the wondrous;
- Investigating: facilitating researching into and searching after the wondrous;
- Discovering: facilitating critical meaning-making, or an appreciation of mystery;
- Developing: helping participants to work with their discoveries; assisting work with things found (including reflection, design, continued seeking);
- Manifesting: providing opportunities to make learning visible via constructions;
- Celebrating: ensuring others can experience work produced in positive environment; sharing findings joyously;
- Propagating: allowing for wondering to continue beyond time and scope of intervention; encouraging growth and development beyond expectation.
The realisation of these phases informed the structure each of the modules as designed. Thus each pursuit was to begin with anticipation and lead, ideally, to the propagation of wonder by participants.

5.2.5 The Goals of the Intervention

I set about designing the intervention with the goals I had established during the exploratory research spiral in mind:

1. An invention for wonder and learning should be **wondrous**. In other words, it should itself be characterised by the experience of wonder: participants should be assisted to feel wonder (e.g. experience ‘wows’) and to wonder about entities (e.g. questioning);
2. An invention for wonder and learning should be **constructive**. It should allow participants to express and share their ideas of wonder with others, via the construction of artefacts and experiences;
3. An invention for wonder and learning should be **propagative**. It should be allowed to grow beyond initial frameworks via encouraging participants’ initiatives.

None of the goals appeared to conflict with the wishes expressed by the teachers I had met. I bore in mind the need for a practical intervention with wide appeal.

5.3 The Wonder Box System

Over time, eight modules (‘boxes’) were visualised and produced. Each module was inspired by a tradition of the heritage of wonder, as identified in the literatures and exploratory research:

1. The Magic Show (Conjuring; Direct Enquiry)
2. Speed Object Lesson (Outdoor Quest; Object Lesson; Direct Enquiry)
3. Wonder Hunt (Outdoor Quest; Direct Enquiry)
4. Wonder Tables (The Nature Table; Direct Enquiry)
5. The Cabinet (Cabinets of Curiosities; The Nature Table; Direct Enquiry)
6. The Quest (Outdoor Quest; Direct Enquiry; Nature Table; Cabinets of Curiosities)
7. Workshops (Direct Enquiry; Cabinets of Curiosities)
8. The Wonder Smash (Cabinets of Curiosities; Conjuring; Direct Enquiry)
The intention was for the boxes to build on one another, each activity set connecting to and elaborating on the work that came before. Where possible, a review of the previous box or preceding boxes was worked into the activities. Furthermore, each box exhibited a microcosmic dimension, reflecting the arc of the intervention: an anticipatory stage heralded the beginning of each box, progressing to an encounter with the wondrous, and leading to a constructive pursuit. They were pursued in the order listed above, and each was assigned a progressive colour on the spectrum to assist in design and implementation.

Each box could be summarised by three key words – helpful for laying bare their workings, and to get to the core aspects of association with wonder. These key words were, I felt, sympathetic to both the heritage of wonder and of accepted practice for learning.
<table>
<thead>
<tr>
<th>Box</th>
<th>Participants</th>
<th>Heritage</th>
<th>Stages</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Yr 5/6 Class Teacher, Thaumaturge</td>
<td>Conjuring</td>
<td>Anticipating</td>
<td>‘Launch’ event. Pupils enter transformed classroom for sequence of imaginative games and initial generation of and sharing of conceptions of wonder.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct Enquiry</td>
<td>Divining</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Discovering</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>Yr 5/6 Class + friends and families, Teacher, Thaumaturge</td>
<td>Outdoor Quest</td>
<td>(Re)searching</td>
<td>Pupils seek conceptions and objects/artefacts of wonder in the world around them.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Object Lesson</td>
<td>Manifesting</td>
<td>Collected items are concealed in crafted boxes and form heart of Wonder Table.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct Enquiry</td>
<td>Presenting</td>
<td>Items are revealed and presented via ‘speed object lesson’.</td>
</tr>
<tr>
<td>Orange</td>
<td>Yr 5/6 Class Teacher, Thaumaturge</td>
<td>Outdoor Quest</td>
<td>Preparing</td>
<td>Timed hunt for wonder taking place in school grounds following consideration of ways of seeking wonder.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct Enquiry</td>
<td>Hunting</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Caring</td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>Yr 5/6 class Teacher, Thaumaturge</td>
<td>Nature Table</td>
<td>Examining</td>
<td>Arrays of collected items and supplementary materials are prepared, presented, and considered.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct Enquiry</td>
<td>Arranging</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Interpreting</td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td>Yr 5/6 class Entire Yr 5/6 Teachers,</td>
<td>Cabinets of Curiosities</td>
<td>Experiencing</td>
<td>Prototype displays and constructions of wonder are created incorporating previously harvested</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nature Tables</td>
<td>Making</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sharing</td>
<td></td>
</tr>
<tr>
<td>Scenario</td>
<td>Participants</td>
<td>Activities</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td>Entire Yr 5/6 Teachers, Staff, Experts, Thaumaturge</td>
<td>OutdoorQuest Direct Enquiry Cabinets of Curiosities</td>
<td>Wonder Quest field trip. Day of events in teams investigating wonders, culminating in displays and presentation.</td>
<td></td>
</tr>
<tr>
<td>Indigo</td>
<td>Entire Yr 5/6 Teachers, Staff, Thaumaturge</td>
<td>Direct Enquiry Cabinets of Curiosities</td>
<td>Day of idea generating, prototyping, research, and preparation for Wonder Event.</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>Entire yr 5/6 Entire School Thaumaturge Visitors</td>
<td>Cabinets of Curiosities Nature Tables Object Lesson Conjuring Direct Enquiry</td>
<td>School-wide happening. Redolent of wonder traditions such as sideshow, museum, ride, Cabinet of Curiosities. Multiple conceptions of wonder displayed and collected.</td>
<td></td>
</tr>
</tbody>
</table>

### 5.3.1 Preliminaries

I visited the school on two occasions on the invitation of the teacher and head teacher. I was not introduced to the pupils. On the first occasion I was able to see the classroom when it was empty, thus giving me a sense of the arena in which I would be working. On
the second occasion, I visited the Year 5 and Year 6 school play. This was invaluable as it provided me with an opportunity to consider pupil ability, energy, imagination, and interest. As a magic practitioner, I felt that having a sense of one’s audience and environment was important. It had been many years since I had visited a school. Although the exploratory research had allowed me to ask children about wonder, this had been a diverse experience. By visiting the school ahead of time as an observer, I was felt more able to prepare the initial set of Wonder Boxes.

5.3.2 Ethics

Informed consent was sought by the preparation of an information sheet and a registration document, an opt-in which required signature of both parent or guardian and child. Provision was made for children who did not wish to be filmed, with an opportunity to write to me, my supervisors, and the board of ethics at the University of Nottingham.

Information sheets were distributed to pupils ahead of time, with consent forms for completion by pupils and parents or guardians. Because the collection of conceptions of wonder relies to some extent on unprompted response, the word ‘wonder’ was not used in the description. Instead, the intervention was presented as a ‘curiosity project’, a description used by the school in its communications with parents. This information was presented several weeks before the launch.

The avoidance of the word ‘wonder’ in the preparatory documents highlights an ethical consideration touched on in the Chapter Three. To what extent is this avoidance a form of deception? As before, I thought of this as part of the tradition of conjuring – the withholding of information in order to achieve an effect. I considered that this misdirection was benign in that it did not mislead or deceive (Marar 2008).

5.4 Account of the Boxes

In the sections that follow, each Box as it happened is recounted. Each is evaluated as an educational experience via its productions and participant reports in line with the objectives described. As with the reconnaissance, data is considered reflexively following the method of constant comparison and contrast (Wellington, 2000). Finally, the system is considered overall. Table 8 shows the timetable for the Wonder Boxes with participants included and the datasets generated.
### Table 8. Timetable of the Wonder Boxes

<table>
<thead>
<tr>
<th>Box</th>
<th>Date(s)</th>
<th>Running Time</th>
<th>Participants</th>
<th>Datasets Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Monday 30 March 2009</td>
<td>2 hours</td>
<td>Pupils (21)</td>
<td><em>Golden Envelope Questionnaires</em> (21)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.30-3.30pm)</td>
<td>Teacher (1)</td>
<td><em>Rainbow Conception Squares</em> (21)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>Mystery Charts</em> (21)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em>Teacher’s written commentary</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Videotape (2 cameras, mounted front and back of classroom)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reflective Journal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Observation Notebook</td>
</tr>
<tr>
<td>Red</td>
<td>Wednesday 10 June</td>
<td>2 hours</td>
<td>Pupils (18)</td>
<td><em>Collected objects and artefacts</em> (17)</td>
</tr>
<tr>
<td>Orange</td>
<td></td>
<td>(1.30-3.30pm)</td>
<td>Teacher (1)</td>
<td><em>Tabletop displays of objects and artefacts</em> (5)</td>
</tr>
<tr>
<td>Yellow*</td>
<td></td>
<td></td>
<td></td>
<td>Videotape (1 camera, mounted front of classroom)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Observation Notebook</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Photographs (6)</td>
</tr>
<tr>
<td>Green</td>
<td>Monday 22 June</td>
<td>3 hours</td>
<td>Pupils (c.60)</td>
<td><em>Pupil reports on a Cabinet of Curiosities</em> (17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(9.00am-12 noon)</td>
<td>Teaching Staff (3)</td>
<td><em>Plasticine models of ‘wonders’ made by pupils for Cabinet</em> (17)</td>
</tr>
<tr>
<td></td>
<td>Wednesday 24 June</td>
<td>3 hours</td>
<td></td>
<td><em>Constructed materials made or sourced by pupils for Cabinet</em> (labels, instructions, artefacts) (not collected)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(9.00am-12 noon)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Observation Notebook</td>
</tr>
<tr>
<td>Color</td>
<td>Date</td>
<td>Time</td>
<td>Participants</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>------</td>
<td>--------------</td>
<td>-------</td>
</tr>
<tr>
<td>Blue</td>
<td>Tuesday 30 June</td>
<td>6 hours (10.00am-3.00pm)</td>
<td>Pupils (c. 75) Teaching staff (6) Visitors (2)</td>
<td>Photographs (10) Display of Pupil’s Work generated during field trip (not collected) Observation Notebook Pupils’ Question Cards (115) Visitor Reports (2) Photographs (12)</td>
</tr>
<tr>
<td>Indigo</td>
<td>Wednesday 8 July</td>
<td>5 hours (9.00am-2.00pm)</td>
<td>Pupils (c.75)</td>
<td>Written and drawn accounts and artefacts for Wonder Show (not collected) Observation Notebook Photographs (5)</td>
</tr>
<tr>
<td>White</td>
<td>Wednesday 15 July Thursday 16 July</td>
<td>6 hours (10.00am-3.00pm) 3 hours (9.00am-12 noon)</td>
<td>Pupils (c.270) Teaching staff (14) Visitors (2)</td>
<td>Exhibitions of Wonder designed, manifested etc. by pupils and teachers (not collected) Visitor Reports (2) Photographs (40) Recorded Interview with Willow Class</td>
</tr>
<tr>
<td>Glass</td>
<td>Friday 17 July onwards</td>
<td>n/a</td>
<td>Pupils (18)</td>
<td>School Web Forum</td>
</tr>
<tr>
<td>Final</td>
<td>Friday 11 December 2009</td>
<td>2 hours (1.30-3.30pm)</td>
<td>Pupils (9)</td>
<td>Questionnaires (9)</td>
</tr>
</tbody>
</table>

Constructions made or completed by participants have been italicized.

*Although the Red, Yellow, and Orange Boxes were designed as separate events, for the study they were run in sequence over the course of a school afternoon.*
5.5  Black Box: The Magic Show

5.5.1  Introduction

The first of the school wonder research pursuits was conceived of as a ‘launch event’, a participatory show for a classroom of pupils which would lead from mystery to revelation. The activities were designed to elicit from pupils their conceptions of wonder, while initiating them into the role of researchers into wonder (or ‘wonder workers’). The main inspiration for design was the magic show as introduced in Chapter Two, an entertainment form associated with the evocation of wonder, with methods that inform timing, pace, structure, and aesthetics.

For this introduction to wonder I took on the role of the ‘mage on the stage’, controlling the ‘magic circle’ of the classroom and presenting a number of activities which required the pupils to produce work and share ideas. Although subsequent pursuits would continue to rely on the idea of a magic practitioner to introduce and catalyse the sessions, the idea would be to ‘fade’ the monopoly of the role as pupils themselves become presenters of wonders.

As suggested in Chapters One and Two, a magic performance can have ‘revelation’ or information as its focus rather than misinformation. For the Wonder Boxes I thought aspects of the magic show would be germane to a productive ‘opener’, particularly if I adapted traditional effects such as production boxes for imaginative conception-yielding pursuits. To this end I designed a prop, the ‘Black Box’ which was to produce materials such as worksheets (themselves designed to have the feel of magical artefacts), issue instructions, and collect the work produced.

Around this box I designed a programme of events inspired by structures I had used in planning magic shows. I considered timing for interest, suspense, aesthetics of materials, and sequencing (Schenk and Sondermeyer 1995). Of particular help were the dimensions of wonder I had drawn from the exploratory work: I approached the design with an eye for mystery, novelty, and status, for example. These became watch words for the production of the materials, and came to inform as many aspects of production as I could identify. For example, even in the selection of small items such as pens to distribute to pupils I chose pens that were unusual (novelty), brightly coloured and reflective (aesthetics), good quality (status), and produced them from a small box (mystery).
I had learnt from both the heritage and the exploratory research that the asking of questions about wonder appeared regularly to elicit wonder. Thus this questioning took centre stage in the classroom intervention. The conceptions I were to seek from pupils were not elicited purely as data to be interpreted, but as exploratory pursuit. In the light of positive interactions with participants during the exploratory research, I sought to bring pupils to awareness of the process of enquiry into the phenomenon of wonder, and the variety of interesting and learning-rich ideas and experiences that could arise from the pursuit. I hoped that a simple question, ‘What does ‘wonder’ mean to you?’, although rather elaborately introduced in the events that were to unfold, would spur imaginations and signal the beginning of a quest which, assisted by the pursuits I would be introducing in later modules, would grow and flourish.

Black Box took place on the afternoon of the day that pupils began revision for SATS examinations. The launch was to be a surprise for the pupils: Mr Oak considered that it would be a stimulating reward, and I was pleased that this unexpectedness and novelty was another way of honouring wonder’s perceived characteristics.

5.5.2 Objectives of the Black Box

The objectives for Black Box are presented below in tabular form. Each of the overall goals for the Wonder Box system were aligned to specific objectives for the individual box.
Table 9. Goals and Corresponding Objectives for Black Box.

<table>
<thead>
<tr>
<th>Goals</th>
<th>Corresponding Objectives for Black Box</th>
<th>Indicators that Objectives Have Been Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 1: The Wonder Boxes enable an experience of wonder and wondering.</td>
<td>Objective 1: To provide pupils with an enjoyable programme of events that piques their curiosity.</td>
<td>Observations of pupils’ positive and interested reactions (e.g. vocalisations of ‘wows’; questioning).</td>
</tr>
<tr>
<td>Goal 2: The Wonder Boxes enable a constructive exploration of wonder and wondering.</td>
<td>Objective 2: To provide pupils with a programme of events that facilitates their wondering about the concept of wonder and the sharing of their conceptions.</td>
<td>Pupils’ successful completion of worksheets and related productions.</td>
</tr>
<tr>
<td>Goal 3: The Wonder Boxes enable the propagation of wonder and wondering.</td>
<td>Objective 3: To provide pupils with a touchstone event that encourages the pursuit of wonder.</td>
<td>Interviews with pupils after the event that indicate they have continued to wonder.</td>
</tr>
</tbody>
</table>

5.5.3 Design: Stages of the Black Box

Three stages were envisioned, each building on the other. Table 10 summarises them and Table 11 provides an outline of relevant instances.
Table 10. The Stages of the Black Box

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipating</td>
<td>Pupils’ curiosity is aroused by a sequence of events designed to initiate</td>
</tr>
<tr>
<td></td>
<td>them into the role of ‘wonder workers’.</td>
</tr>
<tr>
<td>Divining</td>
<td>Pupils are given a sequence of tasks which culminates in the recording</td>
</tr>
<tr>
<td></td>
<td>of their conceptions of wonder.</td>
</tr>
<tr>
<td>Discovering</td>
<td>Pupils share their conceptions of wonder and learn more about their</td>
</tr>
<tr>
<td></td>
<td>ongoing roles as wonder workers.</td>
</tr>
</tbody>
</table>

Stage 1: Anticipating

‘Pupils’ curiosity is aroused by a sequence of events designed to initiate them into the role of ‘wonder workers’.

Pupils enter the classroom in groups of three, where they are guided by the practitioner (hereafter ‘thaumaturge’ or guiding worker with wonder), in silence, through a table of artefacts and signs which instruct them to take their places in the classroom by standing on coloured squares which match the envelopes they have selected. In the middle of the classroom is a large table covered by a black cloth. Electronic music is playing. A picture of a giant eyeball on the whiteboard and two video cameras mounted on tripods signal a climate of surveillance and mystery.

Stage Two: Divining

‘Pupils are given a sequence of tasks which culminates in the recording of conceptions of wonder.’

The silence is broken by the thaumaturge and the pupils open their envelopes. A series of guessing games take place, with pupils being asked first to guess what is under the black cloth, and then to mentally select one of six boxes and divine what is contained within it. When a large black box is chosen seemingly at random, pupils are asked to guess what will happen next. The box is opened, revealing two ballot slots. Pupils post their completed worksheets and collect a small gift in return – a plastic ‘charm’ which pupils use to explore groupings. An instruction sheet and a batch of black envelopes appear
inside the box. The box presents a new challenge: pupils select an envelope and, in secret, are required to define the word they find within by completing two types of worksheet.

By the end of this stage, pupils have completed three ‘divining’ documents:

1. ‘Golden Envelope’: a worksheet on which pupils record their guesses about the mystery boxes.
2. ‘Rainbow Square’: a square of coloured card upon which pupils write their conceptions of wonder.
3. ‘Mystery Chart’: an alien looking artefact bearing glyphs upon which pupils elaborate their conceptions of wonder.

Stage 3: Discovering

‘Pupils share their conceptions of wonder and learn more about their ongoing roles as wonder workers.’

Pupils discover that they have all been describing the same word, though they had been led to believe that they were each working on something different. They compare their ideas in small groups before a class discussion conducted by the thaumaturge. This is followed by a brief presentation and discussion, where the thaumaturge describes his research and enlists the pupils’ help by introducing the next challenge (Red Box, below).
### Table 11: Stages of the Black Box Magic Show, designed to facilitate wonder and wondering

<table>
<thead>
<tr>
<th>Stages</th>
<th>Description</th>
</tr>
</thead>
</table>
| Anticipation         | 1 month before event  
Information/consent sheets distributed to pupils: colourful and interesting, but not providing specific details.  
4½ hours before event  
Pupils are told by teacher that something will be happening in the afternoon.  
1 hour before event  
Pupils are not allowed access to classroom.  
Classroom blinds are drawn.  
15 minutes before event  
Pupils have registration in another classroom. No information imparted by teacher about events ahead.  
Beginning of event  
Pupils queue outside classroom and enter in sequenced groups of three, selected by teacher.  
Initiation events designed to pique interest by being unexpected, aesthetic, playful.  
During event  
Novel and mysterious factors prevail e.g. soundtrack playing, information withheld, apparatus displayed and concealed.  
Divining             | Pupils imagine and record what they think is under the cloth.  
Pupils imagine and record what they think is in the black box.  
Pupils imagine and record what they think will happen next.  
Pupils look in the black box and consider the contents  
Pupils record their conceptions of wonder on two worksheets without sharing ideas, unaware that they are all working on the same question.  
Discovering          | Pupils discover they have been tricked.  
Pupils compare work and swap ideas.  
Researcher introduces next task. Pupils ask questions, make suggestions, and discuss possibilities.  |
5.5.4 **Design: Apparatus**

Magic shows traditionally rely on apparatus, devices operated and manipulated by the magician and, occasionally, the participants. These devices have a potentially strong aesthetic appeal, inciting curiosity via colour, shape, and symbols. My memories of watching magic shows as a child included anticipating the possible uses of props laid out on the magician’s table; later, as a magician myself, I knew to harness my audience’s interest by paying attention to all materials used in performance, and considering the way they were presented.

For every item I assembled for the magic show experience, and for every stage of the show, I asked myself: how can I add or bring out wonder? I looked to the dimensions as design tenets, drawing on the dimensions of ‘mystery’, ‘novelty’, ‘surprise’, ‘status’, ‘meaning’ and ‘interaction’ (as detailed in Chapter 4).
### Table 12. Apparatus Used in Black Box

<table>
<thead>
<tr>
<th>Apparatus</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultraviolet Sign which reads ‘Welcome to the Game’ (T)</td>
<td>Welcoming and surprising pupils</td>
</tr>
<tr>
<td>Library Sign: ‘Silence’ and ‘Thank You’ (T)</td>
<td>Instructing and thanking pupils</td>
</tr>
<tr>
<td>Pens in Pen Box (P)</td>
<td>A selection of new coloured pens presented in</td>
</tr>
<tr>
<td></td>
<td>a black box for pupils to select from</td>
</tr>
<tr>
<td>CD of ambient music <em>(Brian Eno, Neroli)</em> (T)</td>
<td>Creating ambience</td>
</tr>
<tr>
<td>Large image of an eyeball for whiteboard (T)</td>
<td>Creating ambience</td>
</tr>
<tr>
<td>Room fragrance ‘Woodsmoke’ (T)</td>
<td>Creating ambience</td>
</tr>
<tr>
<td>Golden Envelope (P)</td>
<td>Worksheet</td>
</tr>
<tr>
<td>Rainbow Square (P)</td>
<td>Collecting pupils conceptions about wonder</td>
</tr>
<tr>
<td>Mystery Chart (P)</td>
<td>Collecting pupils conceptions about wonder</td>
</tr>
<tr>
<td>Tape recorders (P)</td>
<td>Recording pupils’ discussions of wonder</td>
</tr>
<tr>
<td>Envelopes with pictures of ears (P)</td>
<td>Concealing tape recorders</td>
</tr>
<tr>
<td>Six Boxes (T)</td>
<td>Stimulating pupils’ imaginations</td>
</tr>
<tr>
<td>Black cloth (T)</td>
<td>Concealing items on the central table</td>
</tr>
<tr>
<td>Charms (P)</td>
<td>Small tokens awarded to pupils; used to divide</td>
</tr>
<tr>
<td></td>
<td>class into groups</td>
</tr>
<tr>
<td>Bell (T)</td>
<td>A trick bell, used for signalling beginning of</td>
</tr>
<tr>
<td></td>
<td>tasks</td>
</tr>
<tr>
<td>Timer (T)</td>
<td>Keeping tasks to time</td>
</tr>
</tbody>
</table>
5.5.4.1 The Boxes

Six boxes were used in the Divining stage of the Black Box experience (Figure 11). In line with the design tenet of ‘novelty’ three of the boxes were unique creations in order to guarantee that they were new to the participants. The other three were sufficiently unusual to be of possible interest:

1. Ornate metal tea caddy
2. Wooden box with air holes
3. Metal cash box with slot
4. Large black box with iris
5. Wooden box, labelled ‘BIRDS’
6. Small black cube

Figure 11. The Six Boxes

The large black box (Figure 12) which was to be ‘forced’ during the activities was constructed from cardboard and vinyl. It was inspired by the magician’s ‘production box’ from which unexpected ‘loads’ are produced. It had a simple mechanism – designed so that when the lid was removed, the sides opened, partly revealing the inner chambers within and offering a view of contents. The contents were: black envelopes containing the word ‘wonder’; small gold boxes containing charms; mystery charts; and an instruction
chart in an alien script. On either side of the central compartment were two slots designed to take pupils’ completed Golden Envelopes.

Figure 12. Inside the Black Box

In the programme of events, the Black Box was intended to intrigue, collect and dispense. I hoped it would attract attention and stimulate pupils’ guesses about its concealed contents; it would be opened to reveal several compartments, including game materials (black envelopes) and ‘ballot slots’ for the return of completed cards. A middle section would be opened as a playful challenge, revealing 21 small gold boxes, each holding a unique ‘charm’, serving both as reward and as tool for dividing pupils into multiple teams. Finally, in time-honoured conjuring tradition, the box would produce more materials (charts) shortly after it had been shown as being empty.
5.5.5 Acting: Account of Black Box in Action

Stage 1: Anticipating

I arrived to set up the show an hour before the start time while the 21 pupils who were to participate were at lunch. The classroom was ‘transformed’ by arrangement of furniture, the use of props, music, and scent. These were not elaborate changes – practicality was a requisite, and time was of the essence. During this hour of preparation, eight pupils knocked on the door in an attempt to gain entry. Fortunately, my ‘glamorous assistant’ from the Learning Sciences Research Institute, who had come to set up the cameras and microphone, was on hand to answer the door and deter the visitors.

At the end of lunchtime, pupils queued outside the room and were supervised by the teacher. I rang the hand bell as signal to the teacher that I was ready for the first group of three pupils. I greeteded the group with a smile, pointing to the SILENCE sign. When I saw that pupils had seen the sign, I turned it over so that it read THANK YOU. I then pointed to a blank sign. As pupils moved in to inspect it, I switched on an ultraviolet lamp, and the words ‘Welcome to the Game’ appeared. I then pointed to a sign inviting pupils to choose a coloured pen from a pen box and select a golden envelope. Finally, a notice asked pupils to silently take their places on coloured squares that matched the stamp on their envelopes. I rang the bell, and the next group entered the room.

When all pupils had gone through the process and Mr Oak had taken his place at the desk, I picked up the hand bell and handed it to Lily, indicating that she should ring it. When no sound came from the bell, I took it from her and handed it to Frank, whose efforts were also in vain. I passed the bell around. I mimed that I had an idea, and indicated that all pupils should make a bell-ringing action. When they did so, the bell, which I held aloft, began to ring. The pupils applauded.

Stage Two: Divining

Now the silence had been broken, I welcomed the pupils and introduced the challenge:

‘We’re going to start with a little puzzle. On this table there is something covered. You will have one minute where you will be able to walk around the table. The only rule is that you mustn’t touch the table – or crawl under it, so don’t even think about it... (some pupils laugh). As you walk around, I want you to think about two things. First of all, what do you think is under the cover? And secondly, I want you to make a wish – what do you wish were under the cover? It could be anything... But what I want to say to you, and this
is very important, is that I want you all to be working in secret, like we have from the start. So whatever you write down or think, I want you to keep it to yourself.’

I held up a Golden Envelope and explained that we would each be answering the questions we found on and inside the envelope. Pupils circulated in silence and completed their Golden Envelope questionnaires. There was a brief moment of commotion when Alex realised that his pen had gone missing, and thinking that this was a deliberate trick, expressed complete bafflement to the class. I presented him with another pen.

The questions posed are listed in Table 13, below:

**Table 13. Worksheets Distributed and Questions Asked**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden Envelope</td>
<td>1. How are you feeling right now?</td>
</tr>
<tr>
<td></td>
<td>2. What is your favourite colour?</td>
</tr>
<tr>
<td>Golden Worksheet</td>
<td>3. Your Name?</td>
</tr>
<tr>
<td>(Questions 1-7 printed on materials; Questions 8-14 posed by the Presenter/Investigator)</td>
<td>4. Your Age?</td>
</tr>
<tr>
<td></td>
<td>5. Your Favourite Animal?</td>
</tr>
<tr>
<td></td>
<td>6. What do you think is under the cloth?</td>
</tr>
<tr>
<td></td>
<td>7. What do you wish were under the cloth?</td>
</tr>
<tr>
<td></td>
<td>8. Which box would you most like to open?</td>
</tr>
<tr>
<td></td>
<td>9. What do you think is in the box?</td>
</tr>
<tr>
<td></td>
<td>10. What happens next?</td>
</tr>
<tr>
<td></td>
<td>11. What is this box for?</td>
</tr>
<tr>
<td></td>
<td>12. Write down or draw three things you might find in these small boxes</td>
</tr>
</tbody>
</table>

Questions 6-10 were delivered by me and not written on the worksheets, in order to prevent pupils reading ahead and anticipating the turns of events.
Figure 13. The Golden Envelope as Completed by Fred

Responses to the first question ‘How are you feeling right now?’ revealed a number of co-existing feelings in the pupils:

- ‘Like I’m in a top secret club and scary’
- ‘Confident’
- ‘Golly’
- ‘Excited and I want to know what is under the cloth’
- ‘Very happy and excited. Also curious’
- ‘Excited, scared and strange’
- ‘Surprised and freaked out’

There were a wide range of predictions, including a correct divination, as this sample demonstrates:

- A series of different shaped boxes
- A bridge
- A car
- A fish tank
- Some sweets
- Snakes
- Worms
• Snailes
• A coffin with a box of chocolates on
• Micro cells

The pupils’ wishes were even further ranging:

1. A small car
2. A remote control plane
3. A boat
4. A remote control car
5. Something exciting and maybe edible (a box of chocolates)
6. A big box of sweets (2)
7. Chocolate
8. Cake and Nintendo Wii
9. A box with money in
10. Money
11. A device which will make colourful lights
12. Cricket balls
13. A box with a football in it
14. An animal or something to do with sport
15. Nothing
16. A game or puzzle and food
17. Something funny like a clown
18. A robot that would do anything you tell it to do
19. Eye balls

We reconvened around the table. I asked the pupils if they would like me to remove the black cloth quickly or slowly. Their response was unanimous and loud: ‘slowly.’ In an unplanned sequence, I found myself exploiting this keenness, picking up the edges of the cloth, then delaying the reveal, asking pupils if they were sure they wanted to see what was under the cloth. The videotape shows a host of beaming participants, expressing by turns eagerness and exasperation.

As the six boxes were revealed, pupils leant in to inspect them, but remembered the instruction that they should not touch them. I then announced that they were to decide which box they would most like to open. I asked how we could select at random a box to open. Responses included voting, a bingo ball machine, ‘eeny-meeny-miny-mo’, and
using a die. I took a gimmicked die from my pocket and pupils took it in turns to roll it,
ultimately ‘selecting’ the black box. I asked pupils to ‘step back a bit’: some pupils could
be heard to say ‘Oh, no,’ and Hugo put his fingers in his ears. Lucy turned to me and said
‘It’s like Deal or No Deal’. I found myself exploiting the palpable suspense:

‘Are you sure you want to have a look? (There are cries of ‘Yes!’) O.K, let’s have a look-
see... but first... (some pupils make cheerful exasperated sounds)... ask yourself... what
happens next? (Some hands go up). Now don’t say anything – look in your envelope and
you’ll see a box with a black outline. Here I’d like you to write down what happens next.’

Pupils completed the worksheet, appearing careful not to let anyone see their work, with
some holding the worksheets close to their chests. Their expectations were diverse:

- When the box is opened it will explode or something [will] jump out
- Some sort of spy gadget will pop up
- There is another box inside it with a camera in it
- Maybe there could be a bird in there
- Something flies out
- A shiny pearl pops out
- Pie in face
- Cockroaches come out
- It lets out a mist
- There may be nothing there

Pupils were quick to return to the table. The video tape shows them exchanging glances
and smiling. Mr Oak is also leaning in closely.

‘Shall we take a look? Come a little bit nearer. You don’t need to put your fingers in your
ears, it’s O.K.’

As I open the black box, one pupil can be heard to say ‘What?’, several pupils say
‘Ooooh’, another says ‘What’s that?’ Kelly says ‘There’s something on the lid,’ to which
Linda responds ‘It’s Chinese.’

I asked who was feeling brave: there appeared to be a unanimous show of hands. I tried a
different tactic: ‘Who’s not feeling so brave?’ Hugo and Lily put their hands up. I asked if
one of them would step forward to investigate the box. Lily volunteered and I asked her to
put her finger in the hole in the central panel ‘to see if anything happens’:
Thaumaturge: Can you feel anything?

Lily: Air.

As Lily removed her finger the panel slid down. ‘Can you see how you’ve activated it?’ I asked. The pupils all moved forward in an attempt to look inside the box. I removed a board of alien script from a holder inside the box. ‘And I can tell you how I know you’ve activated it: I’ve got the instructions here. (Pupils laugh). And it says that now the box has been activated, the panel can be removed.’ I turned to Hugo. ‘Now you weren’t feeling so brave earlier, were you? Would you care to see what’s happened?’ I briefed him to remove the panel, revealing the gold boxes beneath. ‘The instructions tell me they are a reward.’ The pupils beamed and gestured. ‘Before you can collect your reward, in the final square on your golden sheets, write or draw three things you might expect to find in the gold boxes.’

Pupils were called upon to post their completed Golden Envelopes into the slots in the box, and upon posting, to collect one of the small gold boxes within. Once all the pupils had posted their worksheets and were holding their gold boxes, I asked who would like to see what they were holding. The pupils were quite vocal. Linda jumped up and down. Henry turned to Mr Oak and said, ‘This is agony.’ When asked why, he responded ‘Because I want to open it.’

Pupils opened their boxes in silence. I asked pupils what they thought the items were for:

Laura: It’s a keyring.

Henry: Maths?

Rory: You can put them in a set.

Kelly: You can draw round them.

Albert: They might be a key.

I looked at my board of alien instructions. ‘We can use them to form teams. Now, how do we form teams?’ John suggested grouping with people who had the same shape; Ben thought of grouping with people with the same colour. I asked pupils to hold up their charms. ‘Let’s find out. I’ll give you two minutes to see what groups you can form.’ I rang the bell and pupils moved around the room, some calling out their colours, others calling out their shapes. The class formed four groups based on shapes. Mr Oak set up four tables. I suggested we form ‘working parties’ and asked who was ready for the
‘Brainstorm Test’. Pupils took their seats. There was a hubbub of conversation. I asked pupils to remember about not sharing ideas: ‘Can I remind you at this stage about secrecy: it’s really, really important that you don’t let anybody see what you’re doing in the Brainstorm Test. Now, what’s happening...?’

I pretended to translate the symbols on the board I had removed from the black box:

‘This box here is a way of extracting things from our heads. This box has a lot of questions to ask, and lots of things inside it. All these things are about finding out and using our imaginations and looking at things closely. And if I look closely and reach in here... I find some more information...’

Pupils could be heard to say ‘Wow’ and ‘Oh wow’ as I removed a batch of envelopes from a concealed compartment. I then introduced the next challenge, where each pupil would receive an envelope, look at the word written on the card inside and, using the coloured square of card each pupil had selected at the beginning of the session, write down their thoughts and associations of the word. I opened two envelopes ‘at random’, employing a simple conjuror’s ruse to reveal two different words, ‘Horse’ and ‘Happiness’ which we discussed. Each pupil was asked to select an envelope, unaware that every envelope contained the same word, ‘Wonder’. Pupils were given five minutes to complete their work in secrecy. Two examples of work are reproduced here (Figure 14 and Figure 15), selected to represent diversity of both style and subject.

Figure 14. Rufus's Conceptions of Wonder
For the final production, I removed a card from the box, written in alien script. I squinted and read aloud:

‘‘Always look carefully and never leave a stone unturned.’ I think this is a clue.’ I moved the box, revealing the Mystery Charts (Figure 16), which Mr Oak then distributed. I asked pupils what they thought they were for:

Anne: Are they Roman numerals in the circles?
Rufus: Are these pictures parts of the body?
Albert: They could be something you have to finish off.
Linda: They look Egyptian.
Rory: These lines could be fold lines.
Eva: A secret code?
Lily: A map?
Henry: Senses of the body?
We discussed how we could use the charts to elaborate our thoughts about the words we had found in the black envelopes. This is how I summed up the discussion to the pupils:

‘This chart, this collecting device that comes from the box, is for your ideas, a way to think about your word... (Pointing to sections) So maybe here you’ll write about your word, maybe here you’ll draw a picture of the word, or a picture inspired by the word. Maybe here you can make a pattern that represents the word? It’s tricky, but who knows? And up here, I’d like you to write what your word tastes like, and here – what does your word look like? Put it underneath the eye. What does your word sound like, does it have a sound? Does your word have a smell? Can you touch your word? This is here to help you get your thoughts out. Again, there are no right or wrong answers.’

Pupils asked a number of questions about completing the chart:

Rose: What does this thing mean again?

Alex: Are we writing similar things to what we wrote in the Brainstorm?

Rufus: If your word doesn’t have any of these do we just leave it blank?

All pupils completed their charts. Rose’s question, ‘What does this thing mean again?’ was repeated by four pupils during the eight minutes given for completion of the chart.
Stage 3: Discovering

After the pupils had completed their charts, I established the ‘revelatory’ nature of the final stage:

‘What we’ll do now is break the secrecy and find out what we’ve been doing. And I’ll tell you a bit more about myself. But first...’

Pupils were instructed to open the packages on the table – envelopes with a photograph of an ear, containing a tape recorder. Pupils were then asked to switch on the recorder and for one minute to discuss the words they had been describing without using the word itself. Each table was then asked to say out loud one of the words they had used:

Thaumaturge: Give one word to describe what you’ve been writing about...

Pupils at Table 1: Mysterious.
Pupils at Table 2: Thinking.
Pupils at Table 3: Surprising.
Pupils at Table 4: Cheerful.
Pupils at Table 5: Wonder.

Pupils at Table 1: Curious.

Pupils at Table 2: Sensing.

I asked if anybody noticed something suspicious. Henry said that it was suspicious that the black box had been chosen, and suggested that the die was fake. Albert suggested that everyone had the same word. I asked everyone to say their word out loud, on the count of three, and was rewarded with a chorus of ‘WONDER’.

Pupils laughed. Some looked confused, some pulled faces of puzzlement and (perhaps) mock disdain. I explained the subterfuge: ‘I wanted to know what wonder meant to each of you, without you swapping ideas with your neighbour.’

Anne immediately asked: ‘If we all had the same word, how come the examples were different?’ I replied: ‘It was a trick,’ pleased that my conjurer’s ‘force’ had not gone unnoticed. I elaborated a little:

‘It was a trick to make you all think you had different words. That way we all produced fresh information.’

Henry again pointed out the ruse: ‘I think it was suspicious how that box was chosen.’

It was time to share ideas:

‘Let’s find out what we came up with. I want you to talk amongst yourselves, around your table. What does wonder mean to you? I’ll give the bell a ring and you’ll have two minutes to talk about what you thought.’

The videotape shows much animated but serious discussion. Laura can be heard prompting (‘What did you think?’) and the words ‘wandering’ and ‘wondering’ can be heard – but beyond this, individual conversations cannot be made out. Rory, Linda, and Eva can be seen pointing to their Mystery Charts.

After two minutes I rang the bell again and coordinated the sharing of ideas:

Thaumaturge: Having worked in clusters it will be nice to break out. So, a quick snapshot now: I’m going to go around the tables and ask each table to talk about wonder and the things they think about wonder until I go ‘Stop’. (Pointing to a table) So maybe you’d like to go first and tell the rest of the class what wonder means to you.

Anne: It was a curious word and you wonder if something is going to happen.
Alex: You have wonderful and wonder, like they’re almost the same thing.

Thaumaturge: Thank you for that snapshot. How about a snapshot over here?

Albert: We thought it was unique. People have lots of different thoughts about what happened – different people have different thoughts.

Hugo: Also it’s a bit mysterious.

Thaumaturge: How about this table? Anything you’d like to share with the rest of the class?

Eva: The girls seemed to draw clouds and the boys just seemed to draw dead people or mad scientists.

Rory: There’s a reason for that, it’s not stupid.

Linda: There’s wonder as in like happiness and wonder as in like a question.

Eva: There’s two sorts of wonders: one could be ‘it’s really good, like nice’, and another one, like you wonder what something is.

Thaumaturge (to Rory): Tell us more about yours.

Rory: Well, wonder. Say if someone’s been shot and everyone thought he was dead, and then he talked and got up and he was all happy – that would be a wonder.

Thaumaturge: And over here?

Rufus: At first we thought the dice were loaded.

Henry: And then there’s wonder as in you find a new thing and it’s wonderful.

Fred: Or you can go wandering through the park.

Thaumaturge: Thank you! There’s some interesting ideas coming out – ideas we can return to.

It was now time for me to make a brief presentation about my work – switching to the white board to show images of the University and artefacts I thought would stimulate the pupils’ imaginations: labyrinths, puzzles, origami models. I then offered up some thoughts about wonder in the form of a potted history:

‘Wonder has an interesting history... In certain centuries wonder’s been a real passion for people. So in the 1500s and 1600s this sort of thing was built (pointing to an engraving of Ole Worm’s Cabinet of Curiosities of 1650). It’s called a Wonder Room or Cabinet of
Curiosities. Inside the Wonder Room you would lay out things that made you feel wonder (pointing to heart) or made you wonder (pointing to head). Museums grew from these Wonder Rooms. And you still see things that look like Wonder Rooms. This shop window in Hull looks wondrous, doesn’t it? (pointing to a slide of a novelty supply shop). And we can make our own at home (pointing to a slide of a home-made Cabinet).

‘Again, there are many definitions of wonder, many different ideas, as we’ve found today in completing our charts and doing the Brainstorm Test. What’s this? (pointing to a slide of a butterfly net). It’s a picture of a net, for catching things. How do we catch wonder? We think about it, use our imaginations, write about it. We can take photographs. We can make questionnaires for people, like you’ve already done today. We can capture things in boxes. This is what we’re going to be looking at in the next session – capturing things.

‘What we’re going to do is become collectors. When you leave the classroom I want you to keep the word ‘wonder’ in your head. Every time you see the word ‘wonder’, every time you hear somebody mention wonder, maybe you have a dream, or read something in a book, or look in a dictionary, I want you to collect it. How do you collect it? You can write it down, take a picture, and if it’s an object, you can bring it in. And in this corner, on that red table, we can put things that describe wonder for us. Now, if it’s an object, the only rule is that we’re going to build secret boxes for them: red boxes. They can be small, or large. They can be made of anything you like. But they have to be boxes that will hold our objects. I also want you to put your name and your charm inside. You have at least till after Easter...And I’m also going to give you these – red passports. Keep these with you and use them to collect any thoughts that might come to you...

I had hoped to lead into a discussion about collecting and seek the pupils’ suggestions for collecting wonders. Time was against me – the end of the school day was approaching. Thinking on my feet, I proposed some rules for collecting before inviting questions from the pupils:

‘These are a few rules I’ve worked out: the box should be red; it must conceal what’s inside; don’t put anything living in the box; don’t put anything dead inside the box; don’t put anything dangerous inside the box. Can you think of any more rules? I guess that’s something you can work out with Mr Oak... Be on the lookout for wonder. Use your senses. Thank you for your time and energy and creativity – it’s been an absolute pleasure and I look forward to coming back.’
The school bell rang. Megan asked ‘Can we make our own boxes?’ to which Mr Oak responded: ‘We’ll talk about that. We’ll be talking about nets on Thursday.’ Rufus asked: ‘Could it be something I wondered how to do, like a Rubik’s Cube?’ I smiled: ‘Great idea.’ I then held up the Library Sign to display the words ‘THANK YOU’.

Linda, Rory, Lily and Henry approached the Black Box and, without picking it up, scrutinised it. Lily asked me if it was Japanese. Linda asked how it worked. Other pupils approached me with questions. Rufus asked again if the die used to eliminate the boxes was loaded. I let him examine the die. Hugo joined in, and the boys began a discussion about how I could have cheated. Albert asked about the University, and asked me about my research. Megan packed her school bag in a dilatory fashion while asking questions about red boxes and collecting. Ten minutes after the school bell had rung Mr Oak cleared the room, telling stragglers that there would be opportunity to talk more about wonder in the week.

5.5.6 Observing and Reflecting: Evaluation of Black Box

Objective 1: To provide pupils with an enjoyable programme of events that piques their curiosity.

The first stage was intended to motivate participants by entertaining them and making them want to know more. Elements of mystery, novelty, and surprise were designed for via apparatus, pursuits, and dramatic sequencing. In the language of motivation and curiosity, both epistemic curiosity and situational interest were harnessed (Berlyne 1954; Hidi and Harackiewicz 2000).

How successful was the programme in creating a situation of wondering and positive affect? There can be no doubt that pupils were curious. Mr Oak reported that at lunch time the pupils, when told that they would be registering in the computer suite, were extremely keen to know more about the experience ahead of them. At lunchtime, as I set up with help from my colleague from LSRI, the blinds had to be drawn as pupils attempted to look in; my colleague found himself opening the door to a number of pupil visitors, each with excuses for needing to visit. With the exception of one girl whose request for her asthma pump was impossible to decline (but who agreed to close her eyes when traversing the classroom), all callers were turned away – and their increased curiosity was indicated by their pleading, their questions, and their exclamations as they were refused entry.
Mr Oak reported that pupils were keen at registration, but not ‘wound up’. He recorded in his log: ‘Children very curious about what would happen and why, in that order.’ The opening events, with pupils entering in small groups and being guided through the contents of the table, had been considered as a way of ‘registering’ participants, making them feel secure, encouraging them to concentrate on the task, surprising and pleasing them. There were indications that this opener was successful as the events unfolded. The library ‘Silence’ sign changing to ‘Thank You’ was heeded by all, and the ‘Thank You’ yielded smiles and nods. From this point until the ringing of the bell, silence was maintained. At the table, pupils did whisper comments to investigator, but these were all expressions of contentment, even joy: ‘Cool’, ‘Hi’, ‘Wicked’. Once in the main arena of the classroom, pupils remained silent, but assisted one another by gesture. Laughter was suppressed by pupils putting their hands over their mouths.

Misbehaviour was never an issue – testament, of course, to the teacher and the pupils themselves – but perhaps a result of an event where unexpectedness and uncertainty meant that participants had no predictable structure to react against. Once pupils had been processed they took their places on coloured squares of cardboard, colours matching the stamp on the golden envelopes/worksheets they had collected. This meant that the first trio of students stood still in silence (but evidently silent amusement) for twenty minutes. What particularly surprised and delighted me was the way pupils assisted in rectifying an unanticipated flaw in audience management design. I anticipated that pupils would enter in their triads, immediately notice the ‘Silence’ notice and the investigator’s gesturing, and thus progress through the signs and registering activities as set up on the table. However, on three occasions, smaller pupils had their view of the table blocked by their peers, and thus began to wander to the right to explore other items on the table. The surprise occurrence was that pupils already processed, standing on the coloured squares, became part of the action – they took it upon themselves to gesture to errant pupils that they should return to the table.

Pupils exhibited self-control when confronted by the central table and its accoutrements covered by a black cloth and red velvet. Even though pupils were required to stand around it – and during processing, this amounted to ten minutes for some pupils – no one made a move to uncover it. Mr Oak did record that a pupil attempted to look under the cloth once action was under way, but this cannot be detected on the videotape.
The way pupils responded to suspense positively might be seen as sign of positive engagement with the experience. In my journal I noted that (as was hoped) pupils were curious to know what was under the black drapes. On three occasions I asked the pupils if they wanted to see, picking up the cloth – then releasing it as I thought of something else to say (a typical ‘feint’ used in conjuring routines to build up suspense). This produced audible sighs from the pupils, increasing each time to the point of Lily saying, without trace of annoyance, ‘Go on!’ What proved most surprising to me, however, and a sign that pupils relished the anticipation, was their response to the question: ‘Would you like me to remove the cloth quickly or slowly?’ The unanimous response (testified by the videotape and a microphone attached to the ceiling directly above the table): the pupils shout out ‘Slowly!’

The Golden Envelope as worksheet provided a register of the pupils’ descriptions of their affective states in the early stages of the pursuit. Two thirds of the pupils used words suggestive of positive affect (‘excited’, ‘like I’m in a top secret club’, ‘happy’), a third used words associated with fear (‘scared’, ‘chilled’, ‘freaked out’). Without interviewing the pupils, it is difficult to ascertain the depth of these feelings (being ‘freaked out’, for example, might not necessarily be a negative experience). However, these responses are a reminder of the need for kindness in the planning of events.

That some pupils’ curiosity was maintained might be seen in Rufus and Henry returning to the topic of the selection of the boxes, with their thoughts about a loaded die. At the end of the lesson, they told me they were going to see if they could replicate the selection procedure. Pupils’ keenness to ask questions about the project and their volunteering of observations I considered a sign that the experience had been both enjoyable and thought-provoking.

**Objective 2:** To provide pupils with a programme of events that facilitates their wondering about the concept of wonder and the sharing of their conceptions.

How successful was the event in liberating pupils’ conceptions of wonder?

During the event, many questions were asked of the pupils. Some of these questions derived from research into conceptions of wonder (‘What does wonder mean to you?’), others were included as ‘warm up’ questions, to get pupils used to thinking and responding. The first set of questions was administered by the Golden Envelopes and Worksheets, collected by pupils when they first entered the classroom. There were
different motivations for the questions themselves: to generate surprise, interest, even excitement. Questions were not asked in the order that might be expected and pupils were not asked to provide their name for the first batch of questions posed on the Golden Envelope. Names were easily matched to answers via the design of the envelope and worksheet; by delaying the identifier question it was hoped that pupils had a sense that this would not be a mundane experience (if a darkened, strange-smelling, and rearranged classroom were not signal enough!). Furthermore, the session itself began by presenting pupils with choices (written commands to select a coloured pen, to choose an envelope with a coloured stamp, and to stand on a coloured square matching the colour of the stamp): it was hoped that questions felt more like gentle challenges to be met, within the rules of a game.

The guessing games that formed the early part of the Black Box experience (‘What do you think is under the cloth?’ etc.) provided a lively inventory, both a good gauge of imagination and interest of this group of 9, 10, and 11 year olds. However the hard edges discernable under the cloth limited guesses – 14 of 21 pupils guessed that a box or boxes were awaiting them. Perhaps an amorphous outline, as considered in earlier designs (using a so-called ‘Ashrah gimmick’) might have generated a wider range of responses. Nevertheless, there were a wide range of predictions.

Asking pupils what they wished were under the cloth yielded different responses. No longer were they quite so focussed on the clues given by the outline under the cloth, with a resulting increase in diversity and imagination. The catalogue of vehicles, food, sports, games, money, automata, and the bizarre represents a mixture of personalities, but above all, the desire for sensual pleasure and the responsive. Perhaps it is no surprise that in a deliberately mysterious and playful scenario pupils expect the opening of a box to be accompanied by some sort of surprise or notable reaction.

The work generated was diverse. The Rainbow Cards used for the Brainstorm Test were completed in a multitude of ways: schema derived from Mind Maps; lists; example sentences. All reflect both techniques learnt in class and pupils’ preferences and abilities. Rufus’s list (Figure 14) reflects the multiplicity of wonder as conceived by an individual, even its contradictory nature (‘want to tell other people... can’t speak, gobsmacked’). Wonder’s potential as a catalyst for learning is also evinced (‘learnt a new thing’), as it its life-affirming significance (‘get’s you alive’). Lauren’s work (Figure 15), ‘It gives you lots of emoushuns at the same time’ (with accompanying nested schema) is a neat
evocation of wonder as a ‘superposition’ of states, including its motivational dimension
(‘It makes you want to find or do something.’)

There was also the confounding of ‘wonder’ with ‘wander’ in 5 of the 21 responses. This
was the first time I had encountered this conflation beyond the literature search. It is
interesting to reflect on the connection beyond the partial homonym: wondrous terrains –
labyrinths, memory palaces, the *hortus conclusus*, even Carroll’s *Wonderland* – activated
in the exploration. I have since noticed that this mixed conception is frequently held by
children, but it was not until the third year of research that I encountered this conflation in
adults, after several hundred conversations.

The Mystery Chart was designed to serve a dual role. It was designed to assist pupils in
elaborating their initial thoughts, as recorded on Rainbow Squares: a back-up in case
pupils were at a loss to make their mark. It was conceived of as a trick, in two senses. In
the first sense, it is a conjuring effect designed to operate in the pupils’ hands: by
rearranging the cut out pieces, the square representing the pupils’ charm symbols can be
incorporated, seemingly impossibly, into the rectangle (see Figure 16). In the second
sense, the Mystery Chart was a trick in that, although designed with specific use in mind
(to help elaborate the pupils’ thoughts), I presented it as a mysterious artefact and
encouraged the pupils to ‘decipher’ it and work out how it could be used. Thus I felt there
were several advantages of this worksheet: it could serve as an object of enquiry, it
embodied a piece of ‘mathemagic’, a dissection puzzle the pupils could explore, and it
could assist in the generation of ideas.

In practice, however, the Mystery Chart was not the success I had envisioned. Firstly, in
order for the dissection puzzle to work, it had, in the first instance, to be dissected. This
would not have been useful during Black Box – there was the issue of timing, and the
problem of cutting up a potential source of data. I thought I might copy the worksheets
and bring them in for demonstration during the next session (Red Box). With the full
programme of events that emerged when the Red, Orange, and Yellow Boxes were run
across a single afternoon, I decided to leave out the Mystery Chart. This meant that a
potential source of wonderment was curtailed.

Pupils’ questions before working with the charts hinted that some considered replicating
the work they had already done for the Rainbow Squares. Other questions suggested that
some pupils were uncertain how to proceed: a downside to the ‘interpreting a mysterious
artefact’ gambit. The completed worksheets were a mixture of offerings: some pupils left
sections blank, others filled sections with negative responses (e.g. ‘does not have a smell’, ‘you can’t taste it’). For others, it proved an imaginative exercise, as with Linda and Rory’s work, and led to an exchange between the pupils about the difference between the ideas of boys and girls. This was an insight which might have been a worthy area of enquiry for the class.

Every pupil had a go at completing the Chart. In each case, it resulted in the pupil producing material not already written on the Rainbow Card, suggesting the benefit of a repeated sampling of ideas, even within the same session. The sections of the chart meant that some pupils considered aspects of wonder they had not addressed on the rainbow card. The divisions for ‘taste’, ‘touch’, ‘smell’, ‘sound’ and ‘thoughts’ drew forth some interesting responses.

An additional benefit of asking pupils for their ideas was that it provided a potential archive of motifs and cartoons that might be used as artwork for a wonder event, such as tickets and posters, as well as a repository of ideas. Had I the opportunity to rerun the event, I would ensure all pupils had access to their original work from which to draw inspiration.

The discussions that formed part of the ‘Discovery’ stage were illuminating. I was impressed by the variety of responses – and indeed by at least one pupil’s sensitivity to this variety (‘different people have different thoughts’). The range of responses vindicated my desire to prevent pupils from sharing ideas at the beginning; it would have been a shame to have ‘collapsed’ possibilities to a few ideas.

The sequence of tasks met the objective of eliciting pupils’ conceptions of wonder. My chief criticism of the event, however, was timing. I had packed a lot into the afternoon, and although all stages and pursuits had been realised, I had found myself wishing for more time during the event to explore ideas that arose. The pupils had plenty to say, and some of the discussions had been rushed or curtailed in order to finish by the end of the school day. On reflection, I would have trimmed some of the pursuits. Since the idea of pupils addressing their conceptions of wonder was central to the event, I would have retained the Rainbow Square and Mystery Chart activities, and considered removing some of the questions presented by the Golden Envelope.

Another consideration would have been to work with the pupils there and then to construct a ‘Wonder Wall’. The work they produced could have been used to create an
informative display about the group’s ideas of the phenomenon of wonder. This would have been of potential use for later activities such as creating arrays, and, with guidance, would have served as potential inspiration for continued exploration and questioning.

**Objective 3**: To provide pupils with a touchstone event that encourages the pursuit of wonder.

Black Box was intended to initiate pupils into the role of ‘wonder workers’, catalysing them as researchers and searchers. I hoped the pursuits would prove popular and amusing, and I drew on my experience as a conjuror to ensure this positive dimension. The unfolding of events, and the sequence of revelations, were designed to ease the pupils into the role; the coda, which introduced the nature of my research and set the challenge of the Red Box, would make the trajectory more explicit, while hinting at some of the events to come, encouraging the continued pursuit of wonder, and instilling a desire to do more.

I hoped this event would remain a positive memory for the pupils, one that motivated them to continue to seek wonder after the event. Only the Red Box event itself would reveal whether or not the challenge had been taken up. Nevertheless, I thought the fact that pupils approached me at the end of the day with a multitude of questions, and the fact that Mr Oak had to clear the room with a promise to pupils that there would be opportunities to continue the work, a good sign. Perhaps my dissatisfaction with timing was unwarranted: the packed programme of pursuits might have fulfilled the adage ‘leave your audience wanting more’ – or, in this case, ‘leave your participants wanting more.’

**5.6 Red Box: The Object Lesson**

**5.6.1 Introduction**

There were three main activities constituting the Red Box package. For the first stage pupils found ‘wonders’ in the world around them, by collecting exhibits (objects and artefacts) and further conceptions of wonder (the pupils’ own, the conceptions of family and friends, and social constructions of wonder as found in media). This was an extension of the work begun in Black Box and was envisioned as a combination of both searching and researching. Pupils were instructed that collected exhibits were to be concealed in boxes made by the pupils; support would be given by the Mr Oak who would deliver a lesson on mathematical nets. Pupils were instructed to ensure that the boxes they produced were red in colour, in order that they could be identified when utilised in the
second stage. Conceptions were to be recorded in pocket notebooks distributed to the pupils; these were referred to as ‘Wonder Passports’, because of their resemblance to passports, and the wish that pupils carried them wherever they went.

In the second stage pupils assembled a Wonder Table to display their packaged items. A space was made on a side table at the back of the classroom which was covered in a red cloth. Pupils were asked to bring in items whenever they wished, and to look after the array.

The third stage was an event where the packages were opened and discussed, in the tradition of Pestalozzi’s Object Lesson (see Chapter Two). The classroom was arranged for an examination of the red boxes and passports, and five pupils were selected by ballot to choose, open and wonder about the object they found in the box. This was followed by a discussion.
### 5.6.2 Objectives of the Red Box

#### Table 14. Goals and Corresponding Objectives for Red Box

<table>
<thead>
<tr>
<th>Goal</th>
<th>Corresponding Objective for Red Box</th>
<th>Indicators that Objectives Have Been Met</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal 1:</strong> The Wonder Boxes enable an experience of wonder and wondering.</td>
<td>Objective 1: To provide pupils with a pursuit that affords the opportunity to search for objects and artefacts of wonder (‘wonders’) and the conceptions of others outside of the school environment.</td>
<td>Pupils collect widely and variedly.</td>
</tr>
<tr>
<td><strong>Goal 2:</strong> The Wonder Boxes enable a constructive exploration of wonder and wondering.</td>
<td>Objective 2: To assist pupils in the production of an enticing display of wonders and to provide the opportunity for the wonders to be explored and discussed.</td>
<td>All pupils are able to contribute to and share in the display.</td>
</tr>
<tr>
<td><strong>Goal 3:</strong> The Wonder Boxes enable the propagation of wonder and wondering.</td>
<td>Objective 3: To provide pupils with impetus to continue looking for wonders and others’ conceptions of wonders.</td>
<td>Pupils report after the event that they have continued to seek wonders.</td>
</tr>
</tbody>
</table>
5.6.3 Design: Stages of the Red Box

Table 15. The Stages of the Red Box

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Re)searching</td>
<td>Teacher, pupils, and thaumaturge discuss the searching for and researching into wonders in the world beyond the school; pupils collect wonders and bring them into school.</td>
</tr>
<tr>
<td>Manifesting</td>
<td>Pupils create packages for their wonders and use these to establish a ‘wonder table’.</td>
</tr>
<tr>
<td>Presenting</td>
<td>Pupils, teacher, and thaumaturge gather to open packages and share their thoughts about them.</td>
</tr>
</tbody>
</table>

Stage 1: (Re)searching

Teacher, pupils, and thaumaturge discuss the searching for and researching into wonders in the world beyond the school; pupils collect wonders and bring them into school.

This stage takes place at the end of the Black Box session. Pupils are briefed in the collecting of both wondrous things and ideas about wonder. They are encouraged by the thaumaturge to seek out examples in the world around them, and to continue to examine their own conceptions. Simple rules are established: the things they collect must be containable in small red boxes which can be amassed in the classroom, and the boxes should not give a clue to their contents.

Stage Two: Manifesting

Pupils create packages for their wonders and use these to establish a ‘wonder table’.

Guided by the teacher in a lesson on mathematical nets, pupils make boxes which will house their exhibits. These boxes, when filled, are placed on a designated table, the ‘wonder table’, awaiting a session when some of the boxes are opened and their contents examined (Stage 3).

Stage 3: Presenting

Pupils, teacher, and thaumaturge gather to open packages and share their thoughts about them.
The thaumaturge, in a pursuit inspired by Pestalozzi’s Object Lesson, conducts a session in which pupils who are chosen at random select a box to open and are guided in the consideration of the contents for their wondrous significance.

5.6.4 Design: Apparatus

Black Box had required a lot of conjuring or conjuring-like apparatus. I felt this was important for a launch event. However, from Red Box onwards I wanted to reduce my provision of materials and props, to make space for pupils to contribute their own objects and artefacts. Thus Red Box saw pupils crafting their own boxes at home or in class using materials not provided by me. The one exception was the so-called ‘Wonder Passport’, a red octavo notebook given to every pupil. These were for the pupils to ‘log’ their encounters with or thoughts about wonder. They were sourced from a Japanese stationers: observing my design tenets, I wanted to ensure that they were novel and held the status of being ‘special’, hoping that this would mean that they were ‘treasured’ by the pupils.

Table 16. Apparatus Used in Red Box

<table>
<thead>
<tr>
<th>Apparatus used in Red Box</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Wonder Boxes</td>
<td>Pupil-crafted boxes containing objects and artefacts of wonder they have collected</td>
</tr>
<tr>
<td>Wonder Passports with pens and pencils</td>
<td>Given to pupils for their recording of ideas about wonder</td>
</tr>
<tr>
<td>Charms</td>
<td>Used by thaumaturge to select pupils at random for the Object Lesson</td>
</tr>
<tr>
<td>Timer</td>
<td>Ensuring the Object Lesson keeps to time</td>
</tr>
<tr>
<td>Cardboard and assorted craft materials</td>
<td>Used by pupils and teacher to create boxes for collected wonders</td>
</tr>
</tbody>
</table>

5.6.5 Acting: Account of Red Box in Action

Stage 1: (Re)searching
Pupils were briefed at the end of Black Box, at the conclusion of my presentation on my research into wonder. The briefing below is transcribed from the videotape:

‘We’re going to become collectors. When you leave this classroom I want you to keep the word ‘wonder’ in your head. Every time something comes up that makes you think of wonder, every time you hear the word ‘wonder’ – maybe you have a dream or see something in a book or look in a dictionary or you have a conversation – I want you to collect it. How do you collect it? You can write it down, you can take a picture, and if it’s an object you might be able to collect it and bring it in.’

‘What I want us to do is to start a Wonder Table in the corner... The only rule is that we are going to make secret boxes for the wonders we collect. Red boxes. They can be small, or large. They can be made of anything you like.... What I’m also going to do is give you these – red passports. [Holding up a bundle of passports]. I’m wondering if you can keep these with you and use them to collect any thoughts that might come to you. We can have a look in these at later sessions.’

At the end of the lesson Henry asked if could bring in something that he had wondered about when he was younger – a Rubik’s Cube. Lucy asked whether she could bring in more than one item.

Although I could not be present I hoped that Mr Oak would provide support and maintain momentum in the weeks to follow.

Thus pupils were entirely responsible for their own encounters and explorations. It would not be until my next visit for the Red Box Object Lesson that I would be able to find out how (and indeed whether) pupils had gone about finding wonders.

Stage 2: Manifesting

The word ‘manifest’ derives from the Latin for ‘hand’ and ‘strike’. It was this tangible and active dimension that I wished for pupils to engage in for the Red Box pursuits: the locating, the assemblage, and finally the shared exploration, the ‘handling’ of conceivably wondrous things.

Where in Black Box I made a number of changes to the classroom to encourage wondering, in Red Box I deliberately made minimum changes. I did not want to be the ‘provider’ of wonderment – by this pursuit I wanted all pupils to be sharing this responsibility. My role for the Object Lesson would be that of ‘host’, with minimal set-up
of the classroom. As the Wonder Table was in a corner of the classroom, I set up five tables in the shape of a horseshoe at the front of the class. Upon the tables I distributed the boxes, paper, and Wonder Passports I had found on the Wonder Table.

As pupils entered the room they were keen to inspect the arrangement. I asked pupils to add any other packages or passports they may have with them. Megan told me she was still making her box; Rose suggested that she thought that I was coming the day after. Rory had his object (‘Is this OK? I found it in the middle of a forest.’) but no box, and set about creating a makeshift cover using a paper prism. Albert added a large black and white gift box, Wallace added a carrier bag tied at the top; two white paper packages and a further seven Passports appeared.

Pupils were keen to find out what would happen next – they did not need to be summoned to the table. On the videotape, pupils can be seen getting up close to the packages. Lucy whispered to me ‘It’s like Christmas,’ referring, I imagine, to the anticipation of opening presents.

Stage 3: Presenting

Using the charms I had created for Black Box, individuals were selected to step up to the table, choose a box or passport at random, and open it in front of everyone. As they examined the item inside, the pupil was given a minute to describe and consider where ‘wonder’ might lie in the contents of the package. This was followed by the person who collected the object identifying themselves and talking about the item. Why had they collected the object? How did they encounter it? Again, time was limited to a minute. Finally, for two minutes, all pupils were encouraged to share their thoughts. Mr Oak and I facilitated, guiding and prompting if needed.

In the time we had available, five contributions to the Wonder Table were scrutinised for their wondrous qualities. Four parcels were opened, containing the following items: an agate; a bottle of ink; a large seashell; an orange stone. One Wonder Passport was consulted, and was open on a page that contained an account of a mobile phone.

An agate:

Lauren was the first to be selected. She chose the largest box and opened it to reveal an agate. She thought it was ‘wonderful’ because it was ‘very decorative with lots of purple on it’, and added that it was ‘smooth, hard, and something you might find in a cave.’
Albert revealed that he was the bringer of this object and thought that it was ‘wonderful’ that on the outside it was a black rock, but inside it was an ‘ornate mineral’. He added ‘I reckon there could be more stuff inside these crystals’ and asked the group if they knew how agates were formed. Mr Oak suggested that this was something they could look into in their lessons.

A bottle of ink:

Rufus opened a red box and found a bottle of ink. He thought it was wonderful because you could write down wonderful things with it, and print things out with it, and ‘draw wonders’. Fred announced that he had collected it because he wondered who first made ink, and how coloured ink was made ‘because you can’t put ink in ink’. In the group discussion, John said that ink was mysterious, ‘like an octopus sprays ink to keep itself covered. You can hide things with it. And you can use ink to cover something on paper.’ Lauren asked how an octopus makes ink, and Rory added: ‘Is the octopus ink waste?’ Mr Oak laughed and said ‘Is it ink or is it something else?’ and again added that this was something they could investigate later.

A mobile ‘phone:

Laura opened a Wonder Passport and read out:

‘A mobile ‘phone is wondrous because you can ‘phone anyone in the world with it.’

She mused: ‘The person thought of a mobile ‘phone because it’s interesting, with lots of different buttons you can press, and you can get them in lots of different colours and shapes and you can have games on them and contacts.’

The discussion raised a rapid sequence of questions about their manufacture and functioning:

Hugo: I wonder how they are made?

Rufus: How do they send their invisible signals?

Albert: How do some of them take pictures and how do they connect to the Internet?

Scott had the last word:

‘How come they used to be quite fat, like bricks, and now they have more stuff in them and they’re really thin?’

A large seashell:
Lily struggled to open the bag that contained the shell as it had been tied tightly. ‘I might need more than a minute,’ she said, and the class laughed. When she removed the shell, a number of ‘wows’ could be heard.

Lily held it to her ear: ‘You can’t hear the sea.’ She identified that it was green and pink, that it was big and curvy, and that the tip of the shell looked like a small shell that had been stuck on. Wallace, whose shell it was, described encountering it on a beach, and when he put it to his ear it was ‘like I was deaf’. We then discussed what we actually hear when we put a shell to our ear. Responses were ‘noise from the sea, the vibrations, might be trapped inside’ and ‘the wind and air circulate around so you can hear it’. Frank mentioned that the shell looked like an ear; Rose that it looked like a wizard’s hat, Wallace thought that it must have been home to a huge hermit crab; and Rufus wondered how it ‘ever came to exist.’

An orange stone:

Kelly unwrapped some white paper to find an orange stone. ‘It’s a stone,’ she said. ‘It’s got all lines in. It’s interesting and it’s got a carving. It feels a bit cold. It doesn’t smell.’ I asked where she thought it came from. ‘Outside,’ she replied, and the class laughed. Frank said he had found it in the playground: ‘I was just walking along...and it just caught my attention. It was like orange and it had lots of marks on.’ I thought this was an opportunity to wonder about the object’s origins and asked: ‘But where did it come from before Frank found it in the playground?’

Hugo: ‘A coal mine?’

Rory: ‘It might have come from outer space.’

Lily: ‘A beach?’

Henry: ‘One day it might become sand.’

Lily: ‘It might have come from the sea before it came from the beach.’

5.6.6 Observing and Reflecting: Evaluation of Red Box

Objective 1: To provide pupils with a pursuit that affords the opportunity to search for objects and artefacts of wonder (‘wonders’) and the conceptions of others outside of the school environment.

It was not possible for me to monitor the pupils’ progress in their searching and researching. I relied instead on the reports of Mr Oak and the pupils themselves.
When I met with Mr Oak off-site a week before the Red Box event, he told me that parcels were being assembled and pupils were ‘itching’ to open the parcels and find out what was inside, to the point that they were ‘begging’ to see what had been collected. He told me that pupils were using their Wonder Passports, and were carrying them in their schoolbags. Some had been left in their classroom trays, other pupils had told him that they were keeping them in their bedrooms. However, none were being left on the Wonder Table. Furthermore, Mr Oak also reported that two pupils had told him that they had found wonders but were unwilling to leave them in the classroom. I realised that I had not considered the issue of security, and wondered if this could be addressed by raising issues of trust, or providing a lockable transparent cabinet under jurisdiction of the teacher or an elected pupil. There was thus a conflict between the practice of collecting and the construction of the collection. I was pleased that pupils were reportedly seeking wonders, but had not anticipated the issue of security.

**Objective 2:** To assist pupils in the production of an enticing display of wonders and to provide the opportunity for the wonders to be explored and discussed.

When I returned for the combined Red, Orange, and Yellow Box event, the Wonder Table proved not to be quite the array of wonders I had originally hoped for: four red boxes, a single Wonder Passport, two folded slips of paper and an unfinished net were seemingly randomly placed on the table, alongside other school materials such as exercise books. It made me realise that some guidelines or support would have been useful, perhaps in the provision of a ‘how to’ guide or photographs of example arrays.

Examining the red boxes, I wondered if the strictures of hand-crafted red boxes was limiting, particularly when I noticed that three of them had been made from white paper then coloured in using red felt-tip pen. I thought the time it would have taken to colour the paper might have been used productively elsewhere, although the pleasure of construction should not be discounted: when I asked Rose at the end of the session why she had not used red paper or cardboard she told me how much she liked colouring.

When the pupils arrived, Fred and Laura told me they ‘couldn’t wait’ to look inside the boxes. Thus some degree of anticipation may have been afforded by even the most rudimentary of displays, and furthermore the pupils’ keenness and Lucy’s whispered comment (‘It’s like Christmas’) satisfied me that there was potential in this practice to pique, sustain, and build on curiosity.
The Object Lesson allowed for a wide ranging exploration of the wondrous. The parcels we opened revealed no duplicates, nor objects barren of significance. Our conversation ranged from the natural world to technology, and while theories and answers were suggested, questions also arose. Clearly each object represented a ‘way in’ for the exchange of information, theories, memories, and (mis)conceptions. After the session I recorded in my notebook the adage ‘A spoonful of ink will make everybody think.’ I had been surprised that something as innocuous as a bottle of ink could open up so many potential conversations.

At our next meeting, before the Green Box event, Mr Oak reported that the items were excellent springboards for continued investigation, and had led to discussion both during lesson time and at the beginning and end of the school day.

**Objective 3:** To provide pupils with impetus to continue looking for wonders and others’ conceptions of wonders.

Was the challenge popular with the pupils and were there signs of the search and research activities being adopted? It is not possible to ascertain the extent of adoption of the practice, although there were positive signs. When I returned for the Green Box event, Linda and Laura told me how they were still ‘red boxing’ – a neologism that I thought one measure of success. New parcels were in evidence in the classroom, although entropy was also in action – boxes were not always placed on the ‘Wonder Table’ and I noticed work in progress in the form of half finished nets on top of a filing cabinet.

The Wonder Passports seemed to be readily employed by pupils after the Red Box event, though here I missed an opportunity in my research practice. On reflection, I should have made collecting in of the notebooks over the duration of the study part of the process, in order that I could review the progress of searching and researching across the class.

During the Red Box afternoon, only eight of the pupils had their booklets with them. Megan and Cherry told me theirs was at home. When I returned for the Green Box, it was a similar situation – passports were dispersed, some in bags, others in trays. I consulted those of Linda and Hugo, recording in my notebook that they had been keeping journals, with pictures and evidence of reflection. There was no way of telling how practice was established with other pupils, although they told me they were busy collecting, and Mr Oak also told me he had seen pupils using their passports. This would have been easy to determine if I had asked or produced a questionnaire about wonder research practices.
Evidence that the passports were popular amongst certain pupils came when I revisited the classroom six months after. By this time seven pupils had left to go to junior school. As part of a class discussion about researching wonder, Laura, Megan, Fred asked if I could supply new class members with Wonder Passports. Linda added this request to her questionnaire: ‘Can we have some more passports?’

5.7 Orange Box: The Wonder Hunt

5.7.1 Introduction

Prior to this module, pupils following the pursuits had had the opportunity to consider and write down their conceptions of wonder and compare the conceptions of their peers (Black Box), opportunity to consider the conceptions of family and friends outside the school, and opportunity to collect objects and artefacts that had wondrous significance (Red Box). In Orange Box, I saw a further opportunity for pupils to seek wonder via a practice, the timed hunt.

There is a difference between a treasure hunt and scavenger hunt. In the treasure hunt, the ‘treasure’ is hidden for participants to discover – often with clues or a map to assist in the location. In the scavenger hunt, participants are given a list of items they must locate by name (e.g. a pin) or by description (e.g. ‘something made of metal’). As pupils were to be instructed to seek wonders and nothing was hidden for discovery, this pursuit was technically a scavenger hunt, relying on chance encounter and the sensibilities of the pupils.

For this pursuit I drew on one of my childhood memories of exploring the garden. I recall standing at the rockery, lifting up stones and being transfixed by what I found beneath them. Here was a world of living things: ants, woodlice, millipedes, spiders. Myriad invertebrates going about what, even to a young boy, were evidently complex lives. From this moment, an act of uncovering, a fascination was born that remains with me today. I wanted this opportunity for the pupils.
### 5.7.2 Objectives of the Orange Box

Table 17. Goals and Corresponding Objectives for Orange Box

<table>
<thead>
<tr>
<th>Goal</th>
<th>Corresponding Objective for Orange Box</th>
<th>Indicators that Objectives Have Been Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 1: The Wonder Boxes enable an experience of wonder and wondering.</td>
<td>Objective 1: To provide pupils with a collaborative pursuit that affords the opportunity to wonder about and wonder at objects and artefacts of wonder in the grounds of the school.</td>
<td>Pupils are able to express their ideas of wonder during and after the event.</td>
</tr>
<tr>
<td>Goal 2: The Wonder Boxes enable a constructive exploration of wonder and wondering.</td>
<td>Objective 2: To provide pupils with guidance and motivation in the collection and examination of wonders.</td>
<td>Pupils are able to successfully scavenge objects and artefacts within the school environment.</td>
</tr>
<tr>
<td>Goal 3: The Wonder Boxes enable the propagation of wonder and wondering.</td>
<td>Objective 3: To provide pupils with impetus to continue ‘scavenging’ wonders.</td>
<td>Pupils report their continued interest in the practice of scavenging wonders.</td>
</tr>
</tbody>
</table>
### 5.7.3 Design: Stages of Orange Box

**Table 18. Stages of Orange Box**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparing</td>
<td>Thaumaturge, teacher, and pupils consider and discuss the rules of the Hunt</td>
</tr>
<tr>
<td>Hunting</td>
<td>Pupils search the school grounds in teams, with support from teacher and thaumaturge</td>
</tr>
<tr>
<td>Caring</td>
<td>Pupils examine the things they have found, with support from teacher and thaumaturge</td>
</tr>
</tbody>
</table>

Stage 1: Preparing

‘Thaumaturge, teacher, and pupils consider and discuss the rules of the Hunt.’

This stage prepares the pupils for a hunt for ‘wonders’ in the school grounds. It begins with a review of how pupils have gone about seeking wonders for the Red Box pursuits, and leads to a conversation about whether or not any techniques or ideas would be useful for the pursuit to follow. This leads into a conversation about items that might be collected, with any rulings concerning safety and care. At the end of the discussion a small array of collected wonders is presented.

Stage 2: Hunting

‘Pupils search the school grounds in teams, with support from teacher and thaumaturge.’

Following the briefing, pupils are given 20 minutes to explore the school grounds in their teams, on the lookout for items they conceive of as wonders, which they collect as appropriate – either collecting the thing itself, or making notes and sketches in their Wonder Passports.

Stage 3: Caring

‘Pupils examine the things they have found, with support from teacher and thaumaturge.’

On returning to the classroom, pupils consider what they have found, examining with eyes, hands, hand lenses, and asking questions of teacher and thaumaturge. I envisioned this as the stage where pupils can expand their curatorial skills beyond the occasional collecting of the red box activities. Here they are asked to assemble items quickly, and are
required to preserve and care for them ‘in the field’ and in the hub of the classroom. Do pupils both care for their collections and care to know more?

5.7.4 Design: Apparatus

Table 19. Apparatus Used in Orange Box

<table>
<thead>
<tr>
<th>Apparatus used in Orange Box</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T)Used by Thaumaturge/Teacher</td>
<td>Orange Bait Box containing selected objects and artefacts collected on previous outdoor hunts (T) during Stage 1, stimulating pupils’ curiosity and prompting them to consider range of possibilities</td>
</tr>
<tr>
<td>(P)Used by Pupils</td>
<td>Charms (T) selecting teams for the hunt</td>
</tr>
<tr>
<td></td>
<td>Bell (T) signalling beginning and end of hunt</td>
</tr>
<tr>
<td></td>
<td>Timer (T) ensuring hunt keeps to time</td>
</tr>
<tr>
<td></td>
<td>Plastic Trays (P) holding objects and artefacts collected</td>
</tr>
<tr>
<td></td>
<td>Plastic folders (P) holding objects and artefacts collected</td>
</tr>
<tr>
<td></td>
<td>Wonder Passports with pens and pencils (P) logging objects and artefacts found but not collectable; recording thoughts, observations, questions</td>
</tr>
<tr>
<td></td>
<td>Digital Cameras (P) logging objects and artefacts found but not collectable</td>
</tr>
<tr>
<td></td>
<td>Magnifying Glasses (P) examining finds</td>
</tr>
<tr>
<td></td>
<td>Field Guides (P) identifying finds</td>
</tr>
</tbody>
</table>

For the Hunt, the apparatus needed to be practical (e.g. portable and weatherproof), and, in keeping with designing for wonder, I wanted it to appeal to the pupils, particularly via the design tenets of ‘novelty’ and ‘status’. The plastic trays were deep and translucent, purchased at a Japanese store: they seemed ideal containers (robust and stackable –easy to transport). The plastic folders were also of good quality, and useful, I anticipated, for
keeping Wonder Passports dry, as well as helpful for holding leaves or items that might blow away.

The orange bait box, which leant its name to this pursuit, like the Black Box before it, was selected to meet the six wonder design tenets of ‘novelty’, ‘mystery’, ‘surprise’, ‘status’, ‘meaning’, and ‘interaction’. Its role was to make the pupils anticipate the contents, as they had done in Black Box and Red Box, and, on opening, to provide examples of the sorts of items that might be found. The box itself would, I thought, be novel to many pupils, and also mysterious – it has a number of holes designed to allow fishing bait to breathe and dry – thus signalling to observant pupils the possible presence of living things. On this occasion, no living things were held in the box, though I selected a range of items that were indicative of life – an empty chrysalis, a nibbled hazelnut, a curled leaf – as well as artefacts I thought were surprising and evocative – a section of a plastic hair comb, the handle of a china cup, a metal thimble. I intended this selection of items to reflect the idea of ‘treasure’ and ‘status’ or quality: I wanted the curated box to suggest that this was not a haphazard plunder of pebbles and leaves, but a considered harvest of things that had made me wonder. I wanted at this stage, along with the introductory discussion, to instil in the pupils an awareness of thoughtfulness and discrimination in their collecting.

The digital cameras and field guides were not part of my original plan for the pursuit. I had envisioned pupils using their Passports to sketch and describe; when Mr Oak proposed the use of cameras I thought it would be interesting to see what happened. The field guides were in the classroom library. Although for this pursuit I was more interested in names and ideas generated by pupils, again I was interested to see how (and if) the reference works would be used.

5.7.5 Acting: Account of Orange Box in Action

Stage 1: Preparing

The transition between Red Box and Orange Box was simple. We kept our places around the horseshoe of tables, but pupils were told they could sit on the on the floor.

The simplest method of creating anticipation I felt would be to ‘lay down a gauntlet’ and so I announced:

‘The next challenge: a Treasure Hunt.’
I then relied on a simple description of the pursuit to create a feeling of anticipation:

‘We’ll have 20 minutes of searching in teams, working together, looking for things you can bring back that you think are wondrous or connected to wonder. And when you’re back, working in the same groups, we’ll be working to assemble a display for us all to look at.’

Rose asked, ‘Are we going to see what everyone else bought?’ I replied, ‘Yes, but we’ll work secretly at first, as team.’ Once again, I felt that the element of mystery was important for motivation and originality of work.

I was interested to bring up the subject of ways of seeking wonder. I asked pupils how they had gone about looking:

Rory: I was looking for something that looked strange in its surroundings – like a man at the bottom of the sea.

Lauren: My tooth dropped out – and I wondered if the tooth fairy would visit.

Rose: I looked for... anything that stood out to me.

Albert: I went to a shop with interesting stuff and I went to find five interesting things.

On retrospect, I would have liked to have asked every pupil about their methods. By this stage in the afternoon I realised that there was a risk that time would run out, and that we needed to move onto rules of the afternoon’s search.

I felt that it was fundamental that pupils approached the potential flurry of the hunt with responsibility. I would have liked for the pupils to have worked out their own responsible rules, but, again, with an awareness of time, I relied on Mr Oak to lay down the ground rules:

‘We can go anywhere in the school grounds, but not where they’re doing the new playground. And obviously don’t mess with the bees... You can collect anything and look for all sorts of things, but please don’t just go along picking flowers and pulling lots of things up.’

Finally, I produced the orange bait box, opened the lid, and passed it before the pupils’ eyes. I made no comment on these items: I wished merely for the pupils to gain a sense of variety and to stimulate their imaginations.
Mr Oak and I worked out on the spot the timings for the hunt: fifteen minutes, after which it would be time for afternoon break. After break, there would be a ‘ten minute top-up’.

I asked pupils to assemble in ‘charm groups’, according to shape (e.g. circles working with circles, rhombuses working with rhombuses). Pupils all remembered the charms they had selected during Black Box. An unexpected occurrence was that, owing to the absence of Cherry, Eva, and Rose, one pupil, Wallace, found himself with no team members. Mr Oak asked him if he would like to join another group. Wallace decided to work on his own.

Stage 2: Hunting

I was not witness to the hunting stage of this pursuit. This was a shortcoming I had not foreseen. It was only on the day that I realised that I needed the twenty minutes allotted to the hunt to pack away the materials of the Object Lesson and prepare the classroom for the Yellow Box tabletop displays. Mr Oak volunteered to accompany the pupils.

What could I observe from my limited vantage point? I could see one group staring at something under a bench in the playground. They had their backs to me. Later I heard a noise and looked out of the window. I spoke aloud to the camera and laughed:

‘I can see pupils outside, picking up, collecting, running – or flying like starlings – across to other parts of the school. With real intent.’

Yellow Box, which would follow immediately after, was envisaged as a way of pupils sharing both collections and practice: I hoped pupils would talk about their experiences of the hunt and recreate moments of encounter which would both stimulate imagination and flag up considerations of practicality.

After break time, the fact that pupils returned with new finds meant that I was able to determine that the majority of pupils had continued seeking in their free time. In fact, several pupils had returned to the classroom to deposit their finds during break. Rory came in with a leaf, adding it to his table (‘There’s always something else’ he told me). Wallace came in ‘I just found something – a wonder’ and again, five minutes later, with beetles in his cupped hands. One pupil, Alex, returned empty handed, but with a report, telling me at the door:

‘Matthew – I just found this rock and it had all these stones in it and it burst. I took a picture of it.’
The four pupils who did not appear to continue collecting over break time (Lily, Henry, Rufus, John) were all in the same team. This team had also appeared to have collected very little during the hunt. Lily came in after break, took her place at the table, and called me over. She showed me a plastic folder containing a leaf and told me, ‘We’ve only got one thing.’ Henry interjected: ‘We’ve taken pictures.’ Rather than ask them about their experience of hunting, I made a suggestion that the team copy out the pictures onto cards. This is when I discovered that the cameras did not possess screens, and were thus not helpful to the immediate pursuit.

Stage 3: Caring

On returning after break time, pupils were very keen to show me what they had collected:

Laura: ‘We found a pine cone.’

Lucy: ‘A really small one.’

Alex: ‘We found this – a mangled sponge ball’

Linda: ‘We found a leaf’

John: ‘Look – this was on the sand.’

Wanting to share their finds and discussion was clearly important to the pupils. Although I intended to support the pupils, I felt that acting as an ‘authority’ could limit interpretation and constrain ideas. I wanted to know what pupils thought and I did not want them to think that I had all the ‘answers’. I thus found myself assuming the role of fellow game player very quickly: when Rory was the first to return to the classroom, I made a show of not looking at his table:

‘I’m not going to look. I don’t want to spoil the surprise.’

By adopting this attitude, I lost out on the opportunity to discuss the pupils’ finds in any depth. However, as we were working against the clock for this pursuit, and as the next pursuit would allow discussion, I felt this was warranted. I was still able to offer support, by offering more trays or practical advice. Thus when Wallace came in with two beetles in his cupped hands, I was able to help him solve the problem of how to prevent them from migrating to another table:

‘What I guess you can do is put this plastic folder on top of the container so you can still see them and they won’t crawl out.’
Pupils wanted to know more:

Albert: ‘I just wondered... (notices his choice of words and laughs, as does Mr Oak and some of the class). In our garden we have little dragonflies – but Wallace said you told him they were something else. What are they?’

Mr Oak: ‘You can show me them and we’ll see, o.k.?'

Questions and questioning also took place with gestures. Before the ‘ten minute top-up’, John, who Mr Oak had pointed out as a pupil who might be difficult to engage, can be seen on the videotape studying a collecting tray, holding it up to the light before reaching for a magnifying glass. After I rang the bell, John approached me with the tray, said my name, and pointed at a mite that was walking across the surface. I asked him if he knew what it was. He said ‘no’. We both looked at the creature, incredibly small, but now of significance. ‘It might be a mite,’ I punned, and we carried on looking in silence. This was a moment of connection, of interest being displayed. My conjuring training made me reluctant to ‘tread on the moment’ (Harris, 1996). An alternative response could have been to return to the Object Lesson, or to deliver information about mites. For me, in this moment, it felt an achievement that there was a moment of connection and interest.

5.7.6 Observing and Reflecting: Evaluation of Orange Box

Objective 1: To provide pupils with a collaborative pursuit that affords the opportunity to wonder about and wonder at objects and artefacts of wonder in the grounds of the school.

The simple announcement of a treasure hunt appeared to generate interest and wondering in the pupils. I made a note in my journal on my journey back to the University:

‘Palpable excitement when I announced treasure hunt. Some wide eyes. Could see that pupils were anticipating the hunt, but they remained attentive.’

The questions asked by the pupils were practical ones, specifically wondering about the terrain.

Did pupils experience wonder during the pursuit? The design of the pursuit did not allow for this to be considered. Pupils’ reported encounters with the wondrous during the hunt would be the subject of the Yellow Box activities, but before this some pupils were keen to tell me about what they had encountered. Alex’s reaction to the stone that burst when he handled it -- he had presumably found an aggregate of sand with pebbles in it -- made it clear that it had surprised and amused him.
No ‘wonders’ were seeded or hidden in advance of the search. There was a degree of luck in whether or not pupils would encounter the conceivably ‘wondrous’. It should be added, however, that no pupil returned without a subject for further investigation.

However, allowing for deeper pupil feedback, either via interview or questionnaire, would have been a boon to understanding whether or not the event had successfully engendered wonder.

**Objective 2:** To provide pupils with guidance and motivation in the collection and examination of wonders.

From both my observation at the time and review of the videotape, participants appeared motivated from the beginning, and proved to be independent workers. After break time and the ‘ten minute top-up’ I was struck by the fact that pupils immediately took their places at their tables and began scrutinising the things they had collected with responsibility. The videotape shows that some pupils are working silently on self-selected tasks: Henry is writing in his wonder passport; Rufus is examining a leaf with a magnifying glass. At other tables, pupils can be seen pointing at their finds and asking questions of one another. Megan, Frank and Albert are sorting through the things they have collected, stopping from time to time to bring something to attention. There are no signs of disruption: no missiles, no attempts to disquiet by setting insects free. Again, it would have helped to ‘drill deeper’ by eliciting feedback from the pupils as, for example, part of a plenary.

The simple tools (trays and folders) yielded greatest benefits. Although digital cameras seemed, initially, to offer useful affordances, they proved a burden, taking valuable time when they malfunctioned, and proving useless in the time frame. Wonder Passports were helpful, but only as an intermediate stage – as pupils chose not to incorporate them in their work. It was not clear whether the guide books were helpful. The videotape does not reveal whether or not the pupils used them.

**Objective 3:** To provide pupils with impetus to continue ‘scavenging’ wonders.

An indication that hunting for wonders engaged the pupils was the fact that the majority continued to search over break time. When the bell rang at the end of break, nine pupils appeared immediately in the doorway, all carrying more things. Within the space of two minutes, all but four pupils came in with objects they had collected in their break time.
Did, however, pupils continue to hunt beyond the afternoon? It is not possible to ascertain. When I returned to the school six months later, two pupils (Wallace and Linda) told me they had continued to hunt for wonders outside school; a reminder that a questionnaire that addressed directly pupils’ adoption (or forgetting) of pursuits would have been helpful.

5.8 **Yellow Box: The Nature Table Gallery**

5.8.1 **Introduction**

This module was designed to be a direct continuation of the Orange Box activities, with the focus on materials collected and deployed during the earlier pursuit. However, I planned it as a stand-alone event, as a safeguard against the vagaries of the school timetable.

As mentioned in Chapter Four, the idea and practice of the Nature Table could offer multiple potential benefits. The Yellow Box module was a chance to pay homage to this school tradition and to allow pupils to evoke their conceptions of the wondrous via the things they had found in the school grounds.
### 5.8.2 Objectives of the Yellow Box

<table>
<thead>
<tr>
<th>Goal</th>
<th>Corresponding Objective for Yellow Box</th>
<th>Indicators that Objectives Have Been Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 1: The Wonder Boxes enable an experience of wonder and wondering.</td>
<td>Objective 1: To facilitate participants’ examination and interpretation of collected wonder materials with a view to sharing them with others.</td>
<td>Observation and questioning of pupils in action.</td>
</tr>
<tr>
<td>Goal 2: The Wonder Boxes enable a constructive exploration of wonder.</td>
<td>Objective 2: To facilitate participants’ collaborative production of arrays of found wonders and their presentation in a way that elicits a meaningful response from the audience.</td>
<td>Observation of (and participation in) the presentation with an eye on questions, theories, and interactions.</td>
</tr>
<tr>
<td>Goal 3: The Wonder Boxes enable the propagation of wonder and wondering.</td>
<td>Objective 3: To foster a culture of wondering (here the ‘scavenging’, examining, and displaying of <em>objets trouvés</em>) beyond the Yellow Box event.</td>
<td>Pupils report their continued engagement with the process.</td>
</tr>
</tbody>
</table>
5.8.3 Design: Stages of Yellow Box

Table 21. The Stages of the Yellow Box

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examining</td>
<td>Pupils examine the things they have found, and consider how they can be deployed for display.</td>
</tr>
<tr>
<td>Arranging</td>
<td>Pupils create displays from the things they have found.</td>
</tr>
<tr>
<td>Interpreting</td>
<td>Pupils visit each of the displays and discuss the experience.</td>
</tr>
</tbody>
</table>

Stage 1: Examining

‘Pupils examine the things they have found, and consider how they can be deployed for display.’

This stage is continuous with the last stage of Orange Box, ‘Caring’. However, it is envisioned as a development of this process, by asking pupils to consider the items before them with an eye for their wondrous qualities to be shared with their peers. Pupils are provided with pens and cards to make ‘museum labels’ if they chose to do so; each table has a sheet of yellow card on which to lay out their displays. Magnifying glasses, tweezers, and brushes are also provided.

Stage 2: Arranging

‘Pupils create displays from the things they have found.’

Pupils are given the task of creating a tabletop display. Beyond this instruction, no rules are provided, in the hope that pupils will be able to work in whatever way they chose. Support is provided by the teacher and thaumaturge: they do not provide factual information or answers, to preserve the climate of wondering about the collected items, but help with any questions about the assembling and interpreting process.

Stage 3: Interpreting

‘Pupils visit each of the displays and discuss the experience.’

Pupils experience one another’s displays. First pupils circulate in silence, observing the arrays; secondly the creators of each display present their material for one minute. This is
followed by two more timed sections: a minute for visitors to ask questions, and a concluding minute for visitors and hosts to offer up a summary of the experience.

5.8.4 Design: Apparatus

Table 22. Apparatus Used in Yellow Box

<table>
<thead>
<tr>
<th>Used by</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T) Thaumaturge/Teacher</td>
<td></td>
</tr>
<tr>
<td>(P) Used by Pupils</td>
<td></td>
</tr>
<tr>
<td>Yellow Card (A2)(P)</td>
<td>Surface for delineating display</td>
</tr>
<tr>
<td>Magnifying Glasses (P)</td>
<td>Examining finds</td>
</tr>
<tr>
<td>Tweezers (P)</td>
<td>Handling finds</td>
</tr>
<tr>
<td>Field Guides (P)</td>
<td>Identifying finds</td>
</tr>
<tr>
<td>Index Cards and pens (P)</td>
<td>Labelling finds; producing signs and instructions for visitors</td>
</tr>
<tr>
<td>Bell (T)</td>
<td>Signalling beginning and end of visits</td>
</tr>
<tr>
<td>Timer (T)</td>
<td>Ensuring ‘visits’ keep to time</td>
</tr>
</tbody>
</table>

5.8.5 Acting: Account of Yellow Box in Action

Stage 1: Examining

This was a short stage, a period of ten minutes which was established in order that pupils could have time to look at the things they had collected before what I anticipated would be a rush of activity in preparation of displays. I had decided not to provide instructions, but to let pupils settle down to their collections, before providing the briefing that would signal the beginning of the next stage, ‘Arranging’. This proved to be a useful approach, as Rufus, Henry and John were delayed in returning from break (although they returned with new ‘finds’ for their table).

The videotape reveals that at the moment before I give the briefing, pupils are at their tables and are all considering the items they have collected, or are producing work:

Table 1: Anne and Lucy are writing or drawing.
Table 2: Wallace is arranging his finds.

Table 3: Rufus and Henry are unpacking their finds.

Table 4: Kelly and Alex are writing or drawing. Linda is aligning the objects on the table.

Table 5: Megan, Frank, Rory and Albert are examining, pointing, and discussing.

Stage 2: Arranging

When all pupils had returned to the classroom I announced the next pursuit:

‘Welcome back. I hope you found some good stuff out there. We now have about ten minutes to make a display, a Table of Curiosities, for other teams to come and have a look at. Remember, you can do anything you like. Arrange things. Maybe draw the things you couldn’t collect: think about what you saw and did and what you smelt. Use the labels and coloured pens – come and get them. Make it all on your yellow sheet – make it your canvas. Be Wonder People. In ten minutes we’ll all get together and have a look at what we’ve done... If you’ve got any questions, I’ll be circulating.’

The videotape shows that there is some interaction between tables, but at the heart of the activity, the five tables work differently and together to produce a display and wonder experience.

Table 1: ‘Our Findings’

Pupils: Anne, Hugo, Laura, Lauren, Lucy.

Laura sits at the head of the table and from the beginning can be seen ‘conducting’ activity at the table. She can be seen gesticulating at the display and, involving all her co-wonderers with another gesture, points at things on the display. She holds up a ‘museum card’ and asks ‘Who wrote that?’ Lucy and Anne do a lot of drawing; Hugo acts more like an electron, regularly leaving his place to investigate something else in the classroom. He is on the ball, nevertheless, when I am called over to the table by Laura who tells me that they have finished. I recommend they tidy up their tabletop and prepare for visitors. Hugo asks me if they are going to do a presentation, and says to the group ‘Maybe we should write down what we are going to say.’ Laura agrees, and looks as though she is chairing a meeting. Anne asks; ‘Can I talk about this?’

The display they produce, ‘Our Findings’, is presented as a collective piece – from the title, to the use of ‘we’ in the museum cards (‘This is the rabbit we took a picture of.’)
There is much to look at, with some items partly concealing others. The display asks questions of visitors by providing questions on cards.

Table Two

Pupil: Wallace.

This is the work of one pupil. Wallace appears engaged throughout. He spends the first three minutes preparing museum cards. Two of these are of things he wasn’t able to collect – ‘toadstalls’ and ‘arome’ (the aroma of plants, Wallace told me afterwards); the third is a label for ‘Shield Bugs’. He places the latter against an aligned tray, and places the other two in the top corners of the yellow card. He is meticulous in the way he prepares his display. He removes one item at a time, placing them on the yellow card with certainty and seeming precision, producing a grid of objects and artefacts. Wallace spends a minute ‘wrangling’ some insects onto a piece of cardboard. He says to me ‘The beetles are hard to control’ as he puts them in the tray with the shield bugs, which forms an adjunct to the display. Wallace’s table is visited by other children – Megan and Frank both cross over to his table to look at his work. Nevertheless, Wallace does not stop arranging to talk, nor does he appear distracted.

The completed work is meticulously ordered, with objects and artefacts arranged in a matrix. It appears from the videotape that Wallace considers each object’s significance before placing it on the table. It also appears that he is deriving his own taxonomy, altering the position of exhibits as he proceeds.

Table Three

Four pupils: Henry, John, Lily, Rufus.

This is a seemingly split team: one girl faces three boys. At the beginning of the pursuit Lily arranges the pens before settling down to produce cards. John looks through the camera lens; Rufus and Henry are drawing.

Henry, picking through the objects that have been collected, shakes a conifer branch. His response – and the response of his team mates – makes it clear that arthropods have been dislodged. Henry spends close to two minutes examining the arthropods, before picking up the conifer branch and shaking it again. A minute later he does it again:

Lily: Did you just...? If you did, it’s mean.
(Henry smiles and holds up the hand upon which insects have been crawling.)

Lily: You shook them off? So they just flew? (mimes a tired winged creature).

(John mimes an energetic winged creature.)

Lily: So a big hand didn’t just go (blows raspberry as she mimes shaking the conifer branch).

Henry: They’re so tiny it doesn’t hurt their body.

The boys’ behaviour appears initially to be motivated by curiosity after a chance find, but develops into a ruse to get a response from Lily. The situation does not escalate, however, and the interaction seems to have worth in that it leads to a discussion about insect sensitivity and ethics.

The finished display is rather sparse compared to those of their peers, and is dominated by the conifer branch.

Table Four

Four pupils: Alex, Fred, Kelly, Linda.

This is another ‘managed’ team, with Linda appearing to conduct the action. She asks her team mates about their work and listens to their responses. She rearranges the display. Materials also appear to be under her jurisdiction: when Kelly moves the pen tray, Linda takes it back and replaces it. Pupils ask her permission to pick things up.

This is another ‘busy’ display, with multiple objects arranged with informative or imaginative labels. The labels are in multiple hands. There are also instructions for the visitor: ‘You can use the tweezers to examine things but please do not break anything.’ Here tools provided for the examination of objects have been incorporated into the finished production.

Table Five: ‘Abstract’

Four pupils: Albert, Frank, Megan, Rory.

This is the most ‘motile’ of the tables. Rory stands up throughout; Albert spends most of his time standing up; Frank moves to the window and looks at the other tables. Megan visits Wallace.

Rory and Albert act as designers. A few minutes into the pursuit they ask me if they can use other things they have brought in for the Wonder Table. I think about it and say no. I
know that the next box will allow the pupils to do this. I had not anticipated the question, but thought it a good sign that pupils were considering content.

In the last minute of the making stage Albert walks to the corner of the classroom and collects some A4 paper. He produces the title for the arrangement: ‘Abstract’.

The layout centres on a large piece of bark, upon and around which have been placed the other found objects.

Stage 3: Interpreting

This stage had to run to strict timing. Pupils were given three minutes to look at one another’s tables in silence. After this we assembled at Table One, where I outlined the order of events: the table’s hosts had one minute to present their table to their visitors, paying particular attention to ‘where the wonder is’; after this, there would be one minute for visitors to ask questions; this would be concluded by a discussion about the table as a wonder experience, again lasting one minute.

Table One:

Each pupil chose to talk about one or more objects:

Laura: We found this leaf over by the climbing frame and we wondered why it was half blue...

Lucy: We picked this up because we wondered how it got that shape, and all the circles...

Anne: Then we found these and we wondered how it gets into... how it grows...

Hugo: How do rocks get their colour and how do they become so hard?

The leaf that Laura described – half green, half blue – was the focus of discussion:

Albert: I think I know how that leaf got blue. Is that a type of fungus?

Megan: It isn’t fungus.

Laura: I think it’s dye.

Mr Oak: I don’t think it’s fungus, but I don’t know.

I moved the questioning onto other items, concerned that in the limited time we consider several objects on the table. In the summing up, however, conversation returned to the blue leaf:
Albert: I like the way that the blue fades in like it’s a natural colour. It’s kind of gradually faded into green.

Teacher: Would that make it natural, then?

Albert: No, it makes it look natural. I know it’s not natural.

Mr Oak: Well, you don’t know, do you?

Albert: I don’t think it’s natural.

Alex commented that the layout was good; unfortunately our time was up and we needed to move on to the next display.

Table Two:

Wallace chose to talk about four objects:

‘Well, I found this snail and so I looked inside but there was nothing in it. And when I was walking past a hut I saw this upside down and it made me think what it came from. And this did make me wonder what sort of bottle it was, and drink... And this, when it’s ready it shoots these and they’re going to start growing.’

Five questions were asked. Three boys wanted to know where items had been found, and Wallace recalled the locations (‘in the woods’, ‘in the gardens’, ‘in the field’). On two occasions, ‘What’s that?’ was asked:

Albert: What’s that?

Wallace: It’s kind of starting off to be a pear.

Mr Oak: Or an apple – who knows?

The feedback was expressed as positives:

Lauren: I like the way he’s set it out, all spaced out.

Alex: I think it’s good for just one person to have done it.

Albert: I think it’s good you’ve put the shield bugs in their own kind of pen.

Rufus: I think it looks like it could be in a glass case. You know those glass cases you get and it has all those Latin names and stuff.

Table Three:
The presentation was led by Rufus, who handled four objects in turn: the branch, a leaf, a stone, and a stick. The object that drew the most imaginative response was the stone:

Henry: Well, I thought this rock was weird. It kind of has all types of holes carved into it and the shape, how it turned out to look like a mountain.

No mention was made of the mite John had found, or of the insects and arachnids dislodged from the branch, which had been the main foci of attention during the construction of the display.

In the questions round, Frank asked why a label read ‘Nothing’ to which Henry replied: ‘Because it’s wondrous. You can’t feel it, you can’t see it, you can’t sense it, you can’t move it, you can’t see it.’

The final feedback was a chance for Rufus to highlight the difficulty they had encountered:

Alex: I think it’s a good display. But it could have more things on there.

Rufus: We did but it’s on the digital.

Thaumaturge: Yes, they’re on the camera. We need to look at technology next time.

Albert: I think it’s really good, but it might have been a good idea to maybe move the conifer away from some of the other objects of wonder, because they’re all a bit close together in some places.

Wallace: And it looks like someone’s been plucking the leaves off it.

Table Four:

The team took turns to point to and describe items. A stone led Fred to wonder:

‘I picked this one because it’s got crystals in it. So I wondered: do all rocks have crystals in them but they’re microscopic so you can’t see them?’

Kelly was interested in how some objects resembled other things:

‘Fred found this and it looks like a pirate’s hat, a bit, and a triangle.

‘This is good because it’s got brown bobbles and they look like coral.’

Laura likened the experience to a guided tour:
‘I like the whole layout and all the different objects and different colours and I like the way they’ve written things, like we’re on a tour and they’re like guiding us.’

Table Five:

Albert introduced the display:

‘This is called ‘Abstract’ because a lot of the flowers are abstract. We found: this nut from the special tree; an acorn; and Rory found that – he thought that it could be a moon rock or meteorite or something. And I put the flower right in the middle of the bark so it works with the display and it looks like it’s all pointing in the same narrow way and direction.’

The pupils responded to the aesthetics of the piece:

Lauren: I really liked the colour of the leaf and I think it’s great that they chose it. It looks good.

Frank: I like the way they’ve set it out because it’s all pointing in the same direction.

Henry: I think it’s good because it’s science-y with all the Nature stuff but then it’s also arty because they laid it out really well.

5.8.6 Observing and Reflecting: Evaluation of Yellow Box

Objective 1: To facilitate participants’ examination and interpretation of collected wonder materials with a view to sharing them with others.

Facilitation for this box meant being a ‘guide on the side’ for the exploration and construction, answering occasional practical questions and providing materials. With the teacher, I tried at all times to avoid stepping in with ‘answers’ to questions, choosing instead to ‘co-wonder’. I was struck by the fact that pupils’ examination of objects and artefacts led to a number of observations and questions that could prove fruitful subjects for continued wondering.

Living things in particular (here limited to arthropods and molluscs) raised a number of questions: reproduction (Wallace’s shield bugs); sensitivity and body size (Henry and Lily’s debate about insects being shaken from a branch); and identification (what was the small creature John found crawling on his folder?). Once-living things (bark, plucked grasses and flowers) and non-living things (stones, bottle tops) were often engaged with aesthetically and imaginatively: berries looked like coral, a pebble looked like a pirate’s hat. This mix of aesthetic and imaginative response which arose ‘naturally’ from the
opportunity strikes me as a good example of how a structure for wondering can yield material for further exploration.

Simple devices – the magnifying glass, tweezers, and brush were supplied in limited numbers (two of each). Table Four can be seen using them, and incorporating them into their display. On this occasion it was not possible to assess their worth for wondering – but it is clear that pupils adopted their use, although it appears that once seized upon by a group, the tools were not circulated to others. In the interests of fairness, each table should have been provided with their own set of devices.

**Objective 2:** To facilitate participants’ collaborative production of arrays of found wonders and their presentation in a way that elicits a meaningful response from the audience.

Pupils appeared to understand what was required of them, and settled down quickly to creating displays. They can be seen taking on different roles – arranging finds, creating labels, or overseeing the processes and making suggestions. Other pupils were more like explorers – visiting other tables or having ideas and asking questions. None of these roles were introduced to the pupils; my hope had been that pupils would be able to assume roles that suited them. My role (and the teacher’s role) would be to assist if pupils voiced uncertainty or seemed restless.

Several of the museum cards bears signs of the working process. On one side of a card produced by Table One is written: ‘Fungi: why where does it grow from?’; on the other side, in a neater and different hand ‘Where does fungi grow from?’ This was the side that was shown on the display. Here work produced by a pupil has been edited and ‘improved’ by another.

The visiting of displays, though brief and limited by time, resulted in many observations and questions which, again, could serve as subjects for future exploration. However, I would consider allowing for more time for this pursuit: I felt that we had only ‘scratched the surface’, and that pupils had much more to say and ask. This is highlighted by the blue and green leaf which generated so much discussion that it threatened to dominate the experience.

**Objective 3:** To foster a culture of wondering (here the ‘scavenging’, examining, and displaying of objets trouvés) beyond the Yellow Box event.
The boxes that were to follow Yellow Box were designed to return to and elaborate on the work done. For example, Green Box would see pupils creating more elaborate displays for a wider audience of peers and Blue Box would see pupils setting up outdoor collecting quests culminating in displays and performances. Beyond the intention behind the design, can it be said that pupils took up the collecting and display practices voluntarily?

Several pupils (Rory, Linda, Albert) told me at the end of the session that they had been collecting wonders at home – they had all set up displays in their bedrooms as a result, they said, of the pursuits. As the project continued, other participants told me about their collections which they had on display in their homes. Although, regrettably, I did not ascertain if any of these collections had been inspired by the intervention, one might acknowledge that pursuits that encourage displays of interest offer the likelihood of this practice increasing amongst participants.

With the expansion of activity represented by the Orange and Yellow Box, I wonder about the possible advantage of running them not together as had happened on this occasion, but with a gap in between. Thus if timetabling had allowed, or Mr Oak preferred, the Yellow Box could be ‘opened’ a week after Orange Box. There would have been issues to consider, such as the preservation of the collection (continued curating, and in the case of decaying materials, collection management) as well as the fostering and maintaining of enquiry (e.g. do we run the risk of participant interest diminishing over time?) By running Yellow and Orange Box together, are we ‘striking while the iron is hot’ and working with energy? Or could we use this gap as advantageous time, in which pupils continue to seek wonders and refine hunting pursuits?

5.9 Green Box: Cabinets of Curiosities

5.9.1 Introduction

The Green Box pursuits were inspired by Cabinets of Curiosities. I had mentioned this tradition to the pupils in my brief introduction at the end of Black Box. Green Box was an opportunity to consider the practice in greater detail, and to elicit from pupils their reactions. This consideration of the heritage was intended to inspire the pupils, and prepare them for the construction of two types of cabinet – the exhibition case and the museum.

The events of Green Box were spread over two mornings, with a day between them, in order to fit in with the school timetable.
5.9.2 Objectives of Green Box

Table 23. Goals and Corresponding Objectives for Green Box

<table>
<thead>
<tr>
<th>Goals</th>
<th>Corresponding Objectives for Green Box</th>
<th>Indicators that Objectives Have Been Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 1: The Wonder Boxes enable an experience of wonder and wondering.</td>
<td>Objective 1: To provide pupils with an experience that affords the opportunity to wonder about and wonder at objects and artefacts presented in cabinets of curiosities.</td>
<td>Observation of pupils’ responses, with semi-structured interviews.</td>
</tr>
<tr>
<td>Goal 2: The Wonder Boxes enable a constructive exploration of wonder and wondering</td>
<td>Objective 2: To provide pupils with the opportunity to consider and construct their own wonders, and to present these wonders to a larger audience consisting of their peers.</td>
<td>Pupils are able to construct interactive exhibits with fitting themes.</td>
</tr>
<tr>
<td>Goal 3: The Wonder Boxes enable the propagation of wonder and wondering.</td>
<td>Although the iterative and elaborative processes contained within the pursuits were intended to be propagative of interest and ability, this goal was not embodied in any specific objective.</td>
<td>N/a</td>
</tr>
</tbody>
</table>

5.9.3 Design: Stages of Green Box

Table 24. The Stages of the Green Box

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiencing</td>
<td>Pupils encounter and consider a cabinet of curiosities provided by the thaumaturge.</td>
</tr>
<tr>
<td>Making</td>
<td>Pupils create contents for a cabinet of curiosities.</td>
</tr>
<tr>
<td>Sharing</td>
<td>Pupils incorporate previously assembled materials and new materials to create a happening to share with their peers.</td>
</tr>
</tbody>
</table>
**Stage 1:** Pupils encounter and consider a cabinet of curiosities provided by the thaumaturge.

This stage is intended to stimulate the pupils’ interest, and to ease them into the process of creating interest for others (Stage 2 and 3). A sequence promotes the pupils’ scrutiny of the cabinet, leading to pupils writing about and sketching their selected wonders, followed by a discussion of work produced.

**Stage 2:** Pupils create contents for a cabinet of curiosities.

Each pupil is given a cubic inch of white modelling clay and asked to create their own items for inclusion in an empty cabinet. Pens are provided for adding colour and detail to the models. After pupils have made their models, they are given index cards on which to create a descriptive ‘museum record’ of their artefact. Pupils gather around to talk about their work and, in turn, place their models into the cabinet.

**Stage 3:** Pupils incorporate previously assembled materials and new materials to create a happening to share with their peers.

The classroom is used by the pupils as an interactive display space for wonder-themed exhibits and experiences. The rest of the year group and their teachers visit the happening.
5.9.4 Design: Apparatus

Table 25. Apparatus Used in Green Box

<table>
<thead>
<tr>
<th>(T) Used by Thaumaturge/Teacher</th>
<th>(P) Used by Pupils</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small cabinets of curiosities (2), one full and one empty.</td>
<td>Displaying curios selected by thaumaturge, and holding artefacts created by pupils.</td>
<td></td>
</tr>
<tr>
<td>Contents of cabinets (see Table 26 and Figure 18)</td>
<td>Objects and artefacts selected by Thaumaturge to pique pupils’ curiosity and stimulate questions and observations</td>
<td></td>
</tr>
<tr>
<td>Modelling clay</td>
<td>Used by pupils to create models of ‘curios’ for inclusion in their cabinet of curiosities</td>
<td></td>
</tr>
<tr>
<td>Felt tip pens</td>
<td>Used by pupils to add details to their clay curios.</td>
<td></td>
</tr>
<tr>
<td>Small index cards</td>
<td>Used by pupils to create a descriptive label for their curios.</td>
<td></td>
</tr>
</tbody>
</table>

The portable Cabinets of Curiosities were identical perspex boxes, transparent on one side and opaque on the other, with 16 compartments. Inclusions were selected from the materia medica (Chapter Four). As a guide to selection, the three traditional cabinet categories of ‘naturalia’, ‘artificialia’, and ‘scientifica’ were considered (Mauries, 2002). Exhibits were selected for their wondrous dimensions (novelty, mystery etc.) and their potential connection to information, anecdote, and story.

5.9.5 Acting: Account of Green Box in Action

Stage One: Experiencing. Pupils encounter and consider a cabinet of curiosities provided by the Thaumaturge.

I arrived before morning registration and set up my materials on a bookshelf at the side of the class. The first Green Box session began with a discussion of wonderings to date. I
wished to promote discussion about the previous boxes, both to collect feedback, and to
fix ideas in the pupils’ minds.

I asked pupils what they remembered about the work we had done so far. Ben recalled
guessing what was in boxes and thinking about wonder. I read out some of the pupils’
ideas and observed that different people think of wonder in different ways. Albert and
Rory volunteered that they had been looking for ‘wonders’ and Mr Oak told me that red
boxes were being opened in the classroom as an occasional treat.

I showed the class a red box of my own, containing the seeds of the Bird of Paradise plant
(Strelitzia). Kelly came up to look at them and described them to the rest of the class,
remembering the process of the Object Lesson, then circulated with them. Mr Oak
suggested the class grow them as a project.

I then asked pupils what other things had made them wonder recently. Lauren mentioned
technology: how did computers connect? How did texts get from phone to phone? Alex
asked how the Internet worked. Linda asked about colour: how did paint work? Pupils
were calling out: ‘How did the Earth have colour?’, ‘What is colour?’ Lily asked about
flasks: how do they keep things hot or cold? Mr Oak suggested that these subjects could
be continued in lessons.

I then talked about the Cabinet of Curiosities as a wonder tradition. I showed A2 pictures
of Cabinets from the catalogues of Imperato (1599) and Worm (1655) (cf. Chapter Two).
I asked pupils what they thought of them. Kelly said that Imperato’s cabinet looked like a
‘seashore museum’. I wondered aloud why there were so many things from the sea. Rory
wondered if this was ‘stuff that had washed up’ from other lands. I used this as a prompt
to talk about other lands, and how else wonders arrived in Europe. Albert suggested this
was by ship, and that there was ‘a lot of exploration’:

‘No wonder there were cabinets of curiosities then, because there must have been a lot of
new and weird things being brought across the sea from explorations.’

I asked the pupils how they thought Cabinets of Curiosities might have been used. I wrote
down their suggestions: ‘seeing things you’ve never seen before’, ‘learning about things’,
‘understanding what things are made of’, ‘getting ideas’. I held up the picture of Worm’s
cabinet and asked the pupils to imagine walking through it, and asked them to think about
how this space would have stimulated all the senses – the smells, textures, sounds. I told
the pupils that this is where the practice of taxonomy developed, the classification of
living things in order to understand how life is connected. I mentioned the traditional separation of items into the divisions of ‘naturalia’, ‘artificialia’, and ‘scientifica’.

Finally, I mentioned that not all cabinets were rooms, and that over time, there was a trend for pieces of furniture that could hold collections. I showed an illustration of the Viennese Imperial collection from 1730. I then suggested that cabinets could be even smaller than this, and produced the Perspex cabinet I had prepared. It was covered with a cloth. Several of the pupils made enthusiastic sounds and I could tell that I had their attention: pupils’ attention was focussed on the cabinet.

Table 26. Contents of the Cabinet of Curiosities presented to pupils, classified according to traditional categories

<table>
<thead>
<tr>
<th>Naturalia</th>
<th>Artificialia</th>
<th>Scientifica</th>
</tr>
</thead>
<tbody>
<tr>
<td>A phial of colloidal gold and a phial of gold leaf</td>
<td>An intricately carved wooden owl</td>
<td>A watch with encoding device</td>
</tr>
<tr>
<td>A living field cricket</td>
<td>African slave money</td>
<td>A glass eye</td>
</tr>
<tr>
<td>A shark tooth</td>
<td>A small metal capsule</td>
<td>A prism</td>
</tr>
<tr>
<td>Liverworts and moss</td>
<td>A scroll of indecipherable calligraphy</td>
<td>A set of levitating magnets</td>
</tr>
<tr>
<td>A preserved rat</td>
<td></td>
<td>A model of the human brain</td>
</tr>
<tr>
<td>A piece of coral</td>
<td></td>
<td>A key</td>
</tr>
<tr>
<td>Oak galls</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I told the pupils that the cabinet would be placed on a table by the door. Everyone would have the chance to look at the cabinet. Pupils would be required to consider the cabinet, and select objects they might describe as wondrous. They were then to produce a piece of work based on what they saw. They were able to return to the cabinet for inspiration, but were asked not to share ideas until later.
After pupils had produced their work, we assembled at the cabinet and I invited the pupils’ questions and observations. As this was part of a full programme of events, time was limited to ten minutes. Pupils wanted to know how the rat came to be in a bottle, leading to a conversation about biological specimens and classification – and the morality of science and the desirability of kindness. The watch allowed us to consider the measurement of time, and, beyond this, the nature of time. The scroll led to consideration of writing systems. I asked pupils to guess the history of the metal ring; they were very attentive when I talked about its history, from its manufacture in a factory in Bristol to its use by slave traders in Africa.

As with previous discussions, I wished for more time, but considered that the cabinet as focus of discussion could be returned to by Mr Oak with the class. I agreed with Mr Oak that the cabinet should stay in the class as a stimulus.

Stage 2: Pupils create contents for a cabinet of curiosities.
Pupils were then invited to make their own cabinet. I produced an identical but empty cabinet box and asked pupils to consider what they would put in the cells to ‘make people wonder, or feel wonder.’ I told them that ‘anything in the world, anything you can imagine’ could go into the cabinet. I then gave each pupil a one inch cube of white modelling clay and coloured pens. Pupils then modelled and coloured ‘curiosities’ for inclusion in the empty cabinet, also creating an accompanying ‘museum index card’, giving the object its name and a brief account of its wondrous connections.

The seventeen clay curiosities prepared by the pupils were diverse, ranging from a replica of Stonehenge to batteries, via nautili, jewellery, and a bowl to hold water.

**Table 27. Contents of the Cabinet of Curiosities produced by pupils, classified according to traditional categories**

<table>
<thead>
<tr>
<th>Naturalia</th>
<th>Artificialia</th>
<th>Scientifica</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raspberry</td>
<td>‘Sacred Art’:</td>
<td>Battery</td>
</tr>
<tr>
<td></td>
<td>Three Cubes and a Twist</td>
<td></td>
</tr>
<tr>
<td>Whale</td>
<td>China Plate</td>
<td>Stonehenge</td>
</tr>
<tr>
<td>Worm</td>
<td>Football</td>
<td>Club</td>
</tr>
<tr>
<td>Bee</td>
<td>Diamond Ring</td>
<td></td>
</tr>
<tr>
<td>Imaginary Creature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jellyfish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fossil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The museum cards included simple to complex nomenclature (‘Raseberry’, ‘Ammonite pachydiscus’), questions (‘How does it [jellyfish] sting’), and reflection:
'A BLUE FOOTBALL. I know a football isn’t that interesting but I wonder how they make footballs, why does a football bounce and why is football so popular? Do you know the answers?'

‘I picked a whale because it made me wonder how the biggest mammal eats plankton.’

The exhibits allowed us to have a wide-ranging conversation. We revisited several of the topics arising from the Red Boxes (cephalopods and ink, geology, diamonds) and the Yellow Box (fruit, bees) and new topics arose – how batteries worked, the role of court jesters, the nature of jellyfish stings. Again, it seemed to be a very fruitful conversation. Pupils were engaged and keen to contribute.

I ended the session by introducing the next Cabinet of Curiosities challenge. I told pupils that they would be required to turn their classroom into a cabinet for the other Year 5 and 6 classes to visit. There were no limits to what they could do, but would need to consider how they could help their visitors wonder and feel wonder. I asked Mr Oak for any guidance. He advised the class that they knew their audience – the key was to get them involved. There were practicalities to consider – setting up, accommodating up to fifty visitors. He summed it up:

‘You’ve got to get them fascinated, interested. That’s what you’ve got to do. You know your audience. That’s the trick to this, isn’t it?’

I reminded the class to think back on the work we had done, and to remember what we had said about Cabinets of Curiosities: we were setting up a space for learning, imagination, and discovery, encompassing all the ideas we had about wonder and wondering.

**Stage 3:** Pupils incorporate previously assembled materials and new materials to create a happening to share with their peers.

The next session occurred two days later. At morning registration Mr Oak told me they had spent a lesson the previous afternoon preparing: discussing how to make a wonder display and deciding what to show. Homework was to bring in exhibits or more ideas to help make the display. As I had not allotted teams or left the Charms, Mr Oak had instead asked pupils to choose people to work with, but not to work in their usual friendship groups.
The Class had two hours to finish and assemble their wonder work, and transform the classroom in readiness for the visit. Mr Oak had arranged that the other two classes in the year group, ‘Rose’ and ‘Vine’ would visit, accompanied by teachers (Mrs Rose and Mrs Vine) and teaching assistants, in timed slots.

Mr Oak reminded pupils of the challenge: ‘remember, you’ve got to get them hooked.’ Henry said ‘It’s a Wonder Smash’. Pupils set about making, transcribing, preparing and transforming with great industry and imagination. Welcome signs were prepared and one team (Linda and Frank) took responsibility for greeting and orientating visitors.

Pupils arranged tables around the edges of the room. Some tables were kept together to make long displays. Exhibits decided on ranged from origami, fossils, nests, games of chance, and guessing the contents of a box. One table was set up to collect from visitors their own thoughts about wonder.

5.9.6 Observing and Reflecting: Evaluation of Green Box

Objective 1: To provide pupils with an experience that affords the opportunity to wonder about and wonder at objects and artefacts presented in cabinets of curiosities.

The review and conversations that began the first session indicated that the practice of wondering (e.g. thinking about wonder and collecting wonders) had been adopted by a number of pupils. I used the time at the end of the lesson to ask quieter pupils if they had been ‘wondering’.

Pupils appeared to be focussed on the task. They scrutinised the contents of the cabinet and settled down to work without disruption. There were return visits to the case and although pupils did not share ideas with words, they pointed at items and bore quizzical expressions. This focus I took to be a sign that the pupils were, at the very least, wondering about the exhibits and were working in the spirit of ‘mystery’ established in Black Box.

The main focus of attention proved to be the bottled rat. The majority of work prepared by the pupils addressed it: what it was; how it came to be there; how long it had been there; the fact that it was ‘slightly off-putting’. Although the presence of the rat did not prevent other objects being considered, I felt this provided a salutary warning about the grotesque’s ability to occlude all other experience. Nevertheless, the conversation we had around the table was wide-ranging. Afterwards, Mr Oak told me he was glad to have the
cabinets left in his classroom, as they would allow further explorations of the topics the pupils had expressed interest in.

**Objective 2:** To provide pupils with the opportunity to consider and construct their own wonders, and to present these wonders to a larger audience consisting of their peers.

The variety of models made by the pupils for the empty cabinet once again reflected a wide range of conceptions. They generated a considerable range of subjects for discussion, and a chance to express interests and passions, from football to fossils, and to ask a range of questions encompassing, for example, zoology, history, and art. With another busy programme, it was disappointing not having the time to continue the conversations. I was pleased that the pupils asked to keep the cabinets in the classroom, and felt sure that they would allow continued thought and possible discussion about the artefacts they had made and the items I had selected.

Henry’s phrase, ‘Wonder Smash’, seemed an appropriate term for the Cabinet of Curiosities experience the pupils prepared. It was very much a ‘mash-up’ of exhibits, styles, and experiences. Items sourced from pupils’ homes (models of rockets, fossilised fish) were mixed with items generated during the earlier pursuits (red boxes, objects found in the school grounds during Orange Box). There were a multitude of signs and labels generated by different hands. The experiences ranged from the provision of refreshments in origami cups made by visitors to ‘open ended’ experiences where visitors could browse the contents of the stall (Kelly’s and Lily’s stall) to challenges such as ‘Secret Wonders’ guessing the contents of the box. It was interesting to see how ideas and items from the previous Boxes were incorporated: visitors were asked to guess the contents of boxes and to write down their ideas of wonder (Black Box) and look at labelled found objects (Orange and Yellow Box).

Pupils were given free-rein in their imagining and development of their ‘exhibit’ or ‘happening’. Very few changes needed to be proposed: pupils had a flair for making what they called a ‘showroom’. On occasion, however, they revealed a lack of understanding how to set up occasions of maximum impact. The importance of gentle guidance from teachers and staff might be illustrated by the following example. One team produced a promotional card which read: ‘Look at this box and guess what kind of shell is inside.’ With a little questioning, they came to see how a simpler ‘Guess What Is in the Box’ might provide a more interesting visitor experience and yield richer responses.
The visits were lively. Visitors appeared very keen to explore the room. With so many exhibits set up to attract attention, it was testament to the stall holders that they held visitors’ attention. As I moved around the stalls, I heard stallholders asking their visitors questions, and inviting them to explore.

Having a sequence of two visits meant that pupils were able to redesign the experience. For example, the welcoming team realised that asking all visitors to make paper cups on arrival was a tall order. They agreed among themselves that their first role would be to encourage visitors to explore the room, and run their origami teach-in for those who visited their stall. Henry, John, Rory, and Albert rearranged their display. I asked them why, and Rory told me it was because it ‘made more sense’ to separate the optical illusions from the outer space exhibits, as this helped visitors understand what they were about. It was a different matter for Lily and Kelly, however, who asked if I had any more ‘wonders’ for their table, because they wanted more things to show their guests. In all these cases, I saw the benefit of repeated experience, and, in particular, how the pupils had a feel for event organisation. I think that providing too many strictures about content or flow would have robbed the pupils of their realisations.

I regret not encouraging or overseeing a more organised visitor feedback stall. Pupils knew how to get ideas from their visitors – a box filled with conceptions on yellow paper, another box responding to questions such as ‘how do turtles live so long?’ – but no general feedback about the experience was collected. Rose noticed this and told me afterwards that she thought it was a shame because it would ‘help us know where we’d got it right and how we could do it better.’

5.10 Blue Box: The Quest

5.10.1 Introduction

The Blue Box represented another expansion in activities. The pursuits, now occurring offsite at a venue of potential value for wondering and wandering, grew to include the entire year group and staff. The event ran for a whole school day. The preceding modules (Orange, Yellow, and Green Box) were extended – participants taking on a sequence of wonder hunts which culminated in a display of the work produced, and a wonder ‘Q&A’ session.
5.10.2 Objectives of Blue Box

Table 28. Goals and Corresponding Objectives of Blue Box

<table>
<thead>
<tr>
<th>Goals</th>
<th>Corresponding Objectives for Blue Box</th>
<th>Indicators that Objectives Have Been Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 1: The Wonder Boxes enable an experience of wonder and wondering.</td>
<td>Objective 1: To provide pupils and staff with a collaborative collecting pursuit that affords the opportunity to explore a venue and wonder <em>about</em> and wonder <em>at</em> objects and artefacts.</td>
<td>Observation of pupil interactions; interviews with pupils about their experiences.</td>
</tr>
<tr>
<td>Goal 2: The Wonder Boxes enable a constructive exploration of wonder and wondering.</td>
<td>Objective 2: To provide pupils with a supportive environment in which to share collected wonders.</td>
<td>Consideration of pupils’ constructions and interactions.</td>
</tr>
</tbody>
</table>

5.10.3 Design: Stages of Blue Box

Table 29. The Stages of Blue Box

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questing</td>
<td>Pupils and staff work in groups on a sequence of quests to identify and collect wonders.</td>
</tr>
<tr>
<td>Showing</td>
<td>Pupils and staff present their findings to one another.</td>
</tr>
</tbody>
</table>

Stage 1: Questing

‘Pupils and staff work in groups on a sequence of quests to identify and collect wonders.’

Participants meet at the venue and, after orientation, are divided into teams. Each team is given an envelope with a timed wonder quest. Each team is given three quests over the course of the day.

Stage 2: Showing
‘Pupils and staff present their findings to one another.’

Participants reconvene at the venue. They set up displays of the day’s work and visit one another’s displays. There is a final ‘wondering’ session where pupils ask questions or make observations about the things they have experienced.

### 5.10.4 Design: Planning a Wonder Quest

#### Table 30. Blue Box Apparatus

<table>
<thead>
<tr>
<th>Apparatus used in Blue Box (T)Used by Thaumaturge/Teacher (P)Used by Pupils</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell (T)</td>
<td>Used for signalling beginning of tasks</td>
</tr>
<tr>
<td>Index Cards (P)</td>
<td>For pupils to create ‘Wonder Cards’</td>
</tr>
<tr>
<td>Paper (A4 and A3) (P)</td>
<td>For use by pupils and staff in quests</td>
</tr>
<tr>
<td>Pens in Containers (P)</td>
<td>For use by pupils and staff</td>
</tr>
<tr>
<td>Wonder Information Sheets (P)</td>
<td>To inform pupils and staff about the day</td>
</tr>
</tbody>
</table>

In the first instance, I needed a suitable venue for a wonder quest. In consultation with Mr Oak, we decided on Wollaton Hall, Nottinghamshire, a venue rich in history, exhibits, and nature. The Hall, built between 1580 and 1588, is set in 500 acres and grounds including a lake, formal gardens, a deer park and expanses of field. It houses Nottingham City Museum and Galleries Natural History collection and also has a museum of Industry.

Tuesday 23 June I scheduled as a preparatory day, when I planned to walk the grounds and the house and its collections, consider activities, and be on the lookout for wonders. I was joined in the morning by a museum interpretation officer, Denny Plowman, who I had approached at the beginning of the research, after recommendations by colleagues. We discussed activities and timetabling. Plowman recommended ‘not packing in too much’ and opportunities for calm and reflection. He thought the day could be considered a success we could get the children interested.

Plowman agreed to take on the role of tour-guide-cum-thaumaturge on the day. We planned that he would take small groups around the collections inside the Hall. The
collections are chiefly zoological, but there is a room dedicated to minerals. In additional, the seventeenth century building has a wealth of historical artefacts and anecdotes. At the top of the Hall, the so-called Prospect Room, accessed by a spiral staircase, gives remarkable views across Nottinghamshire. We toured the house, considering the route, planning for interest and devising vantages for the pupils. We decided that there was a large potential ‘hit rate’ of wonders – sights and experiences that could result in the pupils asking questions or feeling surprise, curiosity etc.

Mr Oak visited the site in the afternoon. We talked of desirable qualities of the pursuits – differentiation, challenge, and the stimulation of imaginations. We talked about the practicalities of school trips, and the desirability of a structure that allowed flexibility. We wandered the grounds and Mr Oak, a former landscape gardener, talked about the importance of the pupils becoming aware of the variety of flora and fauna. He told me that since the Orange and Yellow Box pursuits pupils were continuing to observe and occasionally collect natural specimens from the school grounds and beyond. One pupil had become interested in galls, another in fungi. It would be a boon if the Blue Box could connect to this interest. There would be an additional bonus in that this pursuit would allow for adults to co-explore with children.

We worked out that Mr Oak would have the opportunity to brief the teachers, teaching assistants, and parent helpers who would be part of the Wonder Visit. The brief would be simple – to explore the grounds and buildings of Wollaton Hall alongside the pupils, to share ideas and reactions to nature and artefacts, to be open to not knowing, to be prepared to ‘galumph’, to explore with one eye on mystery and another on ideas that could be shared. Structure would be provided in the form of a timetable, where I would prepare a sequence of ‘mini-quests’ based on different regions of the venue. These quests would suggest things to look out for, or artefacts to make: a structure which would help those adults (or children) less comfortable with an open remit of wandering and wondering. To connect the quests, all participants would be asked to log any wonders they encountered. Wary of the possibility of hardware failure after the cameras malfunctioned or remained unaccessed during Orange Box, I opted to resort to index cards and pens. These records of wonders could be questions or observations.

The day needed a grand finale, an opportunity to share experiences. Plowman had agreed to book the main hall from 4 to 5pm. Pupils would have time to set up displays of the work they had generated and visit one another’s stalls, not unlike the ‘wonder room’ of
Green Box. We planned to have a final question-and-answer session, where questions or ‘wonders’ could be read out. A ‘panel’ consisting of myself, Mr Oak, Plowman, and my supervisor Sharples, who would be visiting for the afternoon session as an observer, would take questions, make suggestions, and encourage reflection and wondering on the day.

With an idea of the structure of the day, I was left alone at the venue to plot the quests. I explored the grounds, keeping an eye open for the wondrous – objects and artefacts that were, for example, novel, mysterious, aesthetically striking, surprising. I also considered ‘learning narratives’ – did these phenomena have the potential to lead to information, ideas, further questions? This focus left me in no doubt as to the power of ‘direct experience’ and the importance of intention: by the end of the day, I saw the potential of all phenomena to lead to wondering, be the phenomena stones, clouds, or lace-making machines. I recalled the discussions of Yellow Box – the mysterious provenance of the orange pebble, the form and function of the feather – and saw around me considerable potential riches.

I mapped the area and found there were five potential diverse regions for exploration. The Hall itself was one, a museum of natural history which, alongside displays of artefacts, struck me as a Cabinet of Curiosities which had been organised into rooms and regions, rather than a Baroque ‘shuffle’. This would be the domain of Plowman – together we had traced a route through the collection which allowed for encounters with many exhibits as well as having the feel of an en promenade performance or fairground ride: through multiple doors, up and down staircases, sudden turns. As an experienced museum worker, Plowman knew the tricks of the trade. He also agreed to liaise with Mr Oak to ensure Health and Safety requirements were met, and to check for any disability requirements. So the Hall would be one quest – an eccentric Cabinet of Curiosities tour, visualised as a ‘ride’.

There was another museum on site: a stable block converted into a museum of industrial machines. Mechanisms designed to tell the time, punch cards, hook and thread were displayed alongside engines and working models in a maze-like yard. Here I thought would be a good place for participants to consider and design a machine for generating wonder.

The outside of the Hall is a confection of architectural styles and flourishes. Statues and gargoyles sport across the facade. Elaborate messages are traced into the brickwork. I
wanted to devise a quest that would encourage participants to notice the details of the building, to engage with the symbols and question meaning and provenance. Around the Hall are gardens comprising both formal beds and wild areas. Mr Oak and I had agreed that a quest which encouraged observation of flora would be a rich potential source of wonders. To balance this, I thought of a quest for fauna, and considered the area around a lake to be a good venue for encountering insects, birds, and fish. Finally, I needed a sixth quest that could ‘roam’ through all areas. I devised a module called ‘The Art of Wonder’ where participants were tasked with creating an artwork that addressed the subject of wonder.

I made a list of what I considered ‘wonders’: trees shaped by the grazing habits of deer; the mint-scented pelargonium; nesting coots; distorting mirrors; glass models of sea creatures. I thought that these wonders could be incorporated into the quest work sheets as a check-list of things to look out for. Again, I was mindful of providing structures that would facilitate the experience of ‘wondering’.

My planning day at Wollaton was an opportunity to experience potential journeys of wondering. Back at the LSRI I set about planning materials would allow a structure of wondering for the day. There were strictures with the timings for the tours of the Hall, so this became my starting point. I timetabled five forty-five minute slots, with an extra slot at the end of the day as a contingency plan. The other quests were planned as 90 minute slots. The plan was that the pupils and staff would be divided into five teams of approximately 16, with teams being given names inspired by the venue. Each team would have a tour of the Hall, and a morning and afternoon quest. We would all meet together at the end of the day for the ‘Wonder Show’ finale.

I prepared simple challenge sheets for each quest and prepared the timetable for the five teams, allowing for orientation and lunch. I considered the need for an ‘information sheet’ and for the first time laid down some thoughts about the phenomenon of wonder. Until now, I had wished for pupils to derive their own conceptions. Here, I suggested some ideas, not to collapse possibilities but to assist pupils in their approaching of wonder. I thought that this was an important ‘way in’: the group of potential wonderers had expanded threefold, and I wanted to provide a simple guide to assist them on the quest for the wonderful. The information sheet was to be distributed to pupils on the coach en route; the worksheets were to be distributed on site at the beginning of the day, during an orientation session I planned to hold in the middle of a field.
5.10.5 Acting: Account of Blue Box in Action

Stage 1: Questing

‘Pupils and staff work in groups on a sequence of quests to identify and collect wonders.’

On the day of the wondering, I arrived early at the site and awaited the arrival of participants who were due to arrive by coach between 9.40 and 10.00am. I received a telephone call from Mr Oak: the coach would be delayed by an hour. I knew that the timetable could accommodate this inconvenience: the quests could be started from the second stage, curtailing the morning’s activities but not preventing them. I had time to rework the introductory session, and Mr Oak agreed to use the coach journey to prepare the pupils and staff. Rather than meet in the middle of a field, we decide to convene in the courtyard; access to facilities would be a priority for the delayed travellers.

For the introductory session I met and greeted the pupils and staff, emphasised the overarching quest of finding wonders and wonder questions, and talked briefly about the nature of the mini-quests and the guided tour of the Hall. We ascertained practicalities – the time and venue for lunch, what to do in an emergency – and the quest envelopes I had prepared were distributed to team leaders. One of the parent helpers had not been able to attend, so I agreed to be in loco parentis and join Mrs Vine in the facilitating of a group. I rang the bell, envelopes were opened, and teams followed maps to their quest areas.

I took my team to a location at the foot of a slope which offered views of the Hall, the stables, and an expanse of grassland. I presented the challenge: to produce a piece of artwork with the title ‘Wonder’. I told the pupils to have a wander and a think, and to return in five minutes. Mrs Vine joined me, and I asked if she had any wishes for the session. She confessed that she would relish the opportunity to make something, but was disappointed that the only materials I had thought to bring were coloured pens and paper. She had an image of a creature with many arms and eyes, and wanted to model it from clay. I vowed to make her a gift of modelling clay when I next returned to the school.

Of the twelve pupils, two were at a loss as to how to proceed. I suggested ways of wondering, as derived by Oak class when Red Boxing: looking closely at things, looking for things that stand out, and stopping and standing still till an idea arrived. In the meantime, one boy started to sketch the Hall and noticed its symmetry. He toyed with the idea of adding extra details. Mrs Vine produced a mirror and he borrowed it to bisect the view of the building, which he continued to sketch. Three boys had had an idea of
drawing the Hall as a dinosaur/building hybrid, and asked if they could work together. The other pupils had by now found places to work on the grass bank, and were quietly drawing. All pupils but one seemed content to settle down to producing wonders. The boy in question, Curtis, was pacing up and down the bank. Mrs Vine told me he was not easy to engage. I saw a challenge, and approached Curtis to ask him about his ideas about wonder. He told me that wonder was ‘things you don’t know about, but you want to know about’. I asked him how a person could make a picture of this. He did not answer, but began to jump and clap. And as he did so, the unexpected occurred: the sound of his clapping returned from the direction of the stables. He stopped, puzzled, and paced along the bank. He clapped again, but this time there was no response. He returned to where I was standing and clapped again. After a split-second delay, the sound of clapping returned. ‘It’s an echo,’ Curtis said. Together we worked out that the sound was being transmitted across the lawn to the courtyard, where it was being amplified and returned as an echo. It was a surprising and striking demonstration of the transmission of sound waves. Other pupils came to test out the phenomenon, and we experimented with different noises. The pupils expressed delight and intrigue. Curtis settled down to draw a picture of his hand radiating sound waves, with the courtyard in the background. He asked if he could take it home for his mother. I asked if he could make a copy for my wonder files. He ran out of time as he enriched the picture with details. At the end of the day he provided me with a pen sketch of his picture as a souvenir.

At lunch time I had the opportunity to ask pupils and staff about their experiences. Pupils were keen to tell me what they had seen, and to show me the wonder cards they had produced. The Flora and Fauna groups had amassed a number of record cards. The Fauna team had included details such as place and time. They were keen to recount how they had watched coots building a nest. They had also been collecting feathers, and asked me if I knew what feathers were, and how they grew. The Machine group reported that they had worked together to produce a design for a machine.

In the afternoon I accompanied my group on a tour of the gardens in a quest for flora. Pupils were keen to ask questions about plants: why some plants had a smell, and how plants got energy from the sun. I confessed that I thought photosynthesis was almost miraculous, and still not quite understood by scientists, although the chemical reactions had been described, if pupils wanted to research them at home or in school. We watched bees pollinating plants, and Mrs Vine told pupils about bumble bee nests, and different
types of bee. One girl asked what a bee sting looked like close-up, and whether different bees had different types of sting. We took a tour of the Camellia House, which I had learnt was one of the first cast iron ‘flat pack’ constructions in the country and had been transported to Wollaton in 1823. Pupils were interested to know how it had been designed, and who first had the idea of building greenhouses. Several girls discovered the mint-scented pelargoniums as they brushed past them.

Our tour of the Hall felt like a cross between a Happening and a fairground ride. Plowman led us through the building via a wayward route. We stopped to examine the glass work of Blaschka, accurate models of jellyfish and hydrozoans. Pupils were keen to know about the creatures they represented, as well as how these fragile and detailed models had remained intact. The Bird Room offered an array of specimens. Pupils asked questions about taxidermy and ethics. We talked about Latin and the Linnaean system of classification. In the Mineral Room pupils looked for sulphur and learnt about carbon allotropes. After nervously climbing the narrow spiral staircase to the Prospect Room, pupils expressed surprise at the views over Nottinghamshire. Mrs Vine confessed she felt something close to awe. We then took another door out onto a rooftop passageway. Plowman stopped and rang a small hand bell, and asked everyone to listen for one minute. Afterwards two girls told me they had heard a bell ring earlier, and now they knew why.

In another room we sat and wrote about or drew our favourite exhibits on index cards. As we left the room to prepare for the Wonder Show finale, pupils told me they were going to come back to Wollaton and take their parents on a tour.

Stage 2: Showing

‘Pupils and staff present their findings to one another.’
The different quest groups assembled at the front steps Hall, as instructed. We were joined by Sharples, who had agreed to take on the role of participant observer. He was to meet the pupils, look at their work, and take part in the final Q&A. I asked pupils and staff to find a space in the room to lay out the work they had produced in order that others could visit them and their work. Group leaders came to me with ‘Wonder Cards’ which I began to arrange on a side table. Within moments the Hall resembled another Cabinet of Curiosities, with a number of different arrays. Some pupils acted as docents, calling pupils over to see their work. Rory and Albert had purchased onyx eggs from the gift shop and incorporated them into a gallery of their group’s work. As I moved around the Hall, I heard pupils swapping stories about the day. A girl was telling a boy about waterboatmen. A boy was asking another if he knew what a ‘ha ha’ was. Mr Oak was answering questions about the tulip tree. Some pupils were producing supplementary materials: signs that read ‘These are some of the Wonders we saw at Wollaton’. Other pupils were sketching the ceiling roses.

I asked the staff what they thought of the quests. Jane and Gwen, both teaching assistants, thought they were long enough to allow for exploration, but not too long that pupils became bored. Mel, a parent, said that they allowed for exploration, but were sufficiently
open to ‘allow things to happen’. She reported that the pupils were ‘transfixed’ by some of the creatures they saw by the lake. ‘It was as though by being given permission to look for things, they found things.’ Mrs Rose described standing in the garden with pupils ‘rapt’ by the sight of two ‘bright blue damselflies dancing.’ Mr Oak said he was pleased to be able to point out specimens such as the Indian Bean Tree, but added that pupils, once they ‘got the hang of looking’, were keen to point out plants and flowers. ‘They were particularly taken by a gnarled yew tree, and a planting of very scented lavender. And they asked some very good questions.’

One girl, Emily, approached me to tell me about her group’s experience by the lake. They had been preparing material for the ‘Art of Wonder’ quest and had written a song. She wondered if she could perform it before the questions were read out. I was deeply impressed by her initiative and bravery. I immediately said yes – and as I did so I noticed the gallery, evidently in need of a minstrel. I checked that the gallery was accessible, took a few aerial photographs (Figure 19), and checked that Emily was ready to open the ceremony. I rang the bell, pupils and staff sat on the floor in the centre of the Hall, and Emily’s bright clear voice sang of the Lake of Wonder to the tune of Michael Jackson’s *Thriller*.

The Wonder Show was underway. I acted as MC, thanked everyone for their energy and wondering, and invited pupils to share their wonders. There was a quick succession of observations – how dragonflies shone in the sun, how trees had different shaped leaves, how you could see how stones got worn away by water. Sharples and Oak read out questions from the Wonder Cards:

- ‘What is the green thing in the lake?’
- ‘What does resin do?’
- ‘How comes the pine cone has a weird pattern and sticks out oddly?’
- ‘Why do some trees have weird patterns on the bark?’
- ‘Why do nettles sting you?’
- ‘Why was the family logo an owl?’

We attempted some answers, and shared thoughts about algae, protective mechanisms, Fibonacci sequences, symbolism. Pupils met our answers with more questions. Was it true that some algae could kill you? Was the substance in nettles similar to that in wasp stings? Was it true that amber was fossilised resin?
Staff came to remind us that the Hall would be closing in ten minutes. Mr Oak drew the session to a close, and hoped that the day would live on in everyone’s memories. He announced that very soon I would be returning to Rabbit Island School, where once again we would work together to produce a Wonder Show. There were, gratifyingly, a few cheers. I reminded pupils that ideas and work that we had generated might prove useful.

The art works, reports, maps, designs, and sketches were collected up by the pupils. Several pupils asked me if they could take their work home. The work that remained, including the Wonder Cards, I parcelled up to add to my resource of wonder work, planning to return with it on my next visit to the school.

Back at the LSRI, I looked through the folders of work that pupils and staff had produced. There were 115 cards, of which 29 bore multiple questions, yielding a total of 271 questions produced by participants over the day, in addition to the quest work. These questions were largely site specific e.g. ‘How are the faces carved on the Hall’, with only 17 questions addressing the world or behaviour beyond the walls of Wollaton e.g. ‘Where do flowers get their colour?’

The work for the Flora and Fauna quests consisted of index cards upon which pupils and staff had drawn wondrous phenomena. Some cards had pictures on one side and questions on the other. Some bore the time and location of discovery. I noticed that pupils were particularly intrigued by simulacra – objects that resembled other objects, such as a tree that looked like a person and a stone that looked like a hand. There were also a number of cards that expressed aesthetic delight at, for example, the scent of lavender. I was quite overwhelmed with the volume of material but decided that these were worth cataloguing after I had returned to the school with them, for their potential incorporation into the White Box Wonder Fete.

I noticed with some disappointment that the designs for machines that generate wonder were not amongst the papers.

5.10.6 Observing and Reflecting: Evaluation of Blue Box

Objective 1: To provide pupils and staff with a collaborative collecting pursuit that affords the opportunity to explore a venue and wonder about and wonder at objects and artefacts.

I had planned to spend the day moving from group to group, observing and assisting participants. This movement was curtailed by my taking on the role of facilitator to a
group. I relied on conversations with staff and pupils to ascertain the success or otherwise of the different quests for fostering wonder, but had the advantage of closer involvement with the group I took.

The pupils I worked with were serious about the pursuits, and generated many questions and ideas. The art class produced some impressive imaginative material. I was rather taken aback by Curtis’ discovery of the echoing properties of the courtyard. I was also rather overwhelmed by the quantity of work that the day generated, and the potential riches for further exploration.

Did the quests allow pupils to wonder about and wonder at things they encountered?

There was certainly a wealth of material generated, as Figure 19 suggests. The contents of the work covered a great variety of subjects. These works, especially those that were annotated, offer insights into pupils’ conceptions of the wondrous, particularly subjects that were considered mysterious and/or beautiful. More importantly, the work indicated that some pupils really ‘got close’ to nature and witnessed both its detail and its potential mysteries. I recall finely detailed sketches of leaves and feathers, and questions about minutiae. The issue of site-specific wonders reflects the nature of the day’s quest; it seemed to me that this was a collection of local wonders that could be returned on another occasion to explore similar ideas in the world at large.

**Objective 2**: To provide pupils with a supportive environment in which to share collected wonders.

Sharples’ report on the display of work in the Hall and the Wonder Q&A is a reminder of why a field trip in search of wonder might be desirable:

‘What surprised me most was how engaged the children were at the end of a long day. The children I talked to were eager to show and share and they had fully entered into the spirit of ‘collecting wonders’. Setting up their wonder collections worked well – they were all engaged, no groups sitting around gossiping, and they had clearly thought how to present their material.’

Plowman noted in a reflective report:

‘(The pupils) worked with a will, showed a lot of interest in the marvels around them and, most of all, asked questions about what they saw.’
The final Q&A was, fascinatingly, the only recorded contention of the day. For Sharples it was a positive boon:

‘Sorting through the cards showed a complete range from the mundane (When was the house built?) to the observant (What is the green patch in the lake?) and the curious/inspired (Why do animals have bones?). The final Q&A was a joy, showing the power of collective wisdom.’

For Plowman, however, the strengths of the day lay elsewhere:

‘This led to what was, for me, a step away from the wonder concept when the grown-ups reverted to type (i.e. became teachers again, rather than wonderers) and began to answer the questions – didacticism had struck. This is not to say that the questions should necessarily be left unanswered but was perhaps not the moment to do so.’

Clearly there is a tension between ‘wondering’ and the working towards ‘answers’, however tentative. It is interesting that Plowman considers a continued suspension of the ‘A’ in ‘Q&A’. Given more time and a guarantee that a follow-up session could take place, this would be worth exploring.

5.11 Indigo Box: The Workshop

5.11.1 Introduction

This event saw the entire year group meeting to consider the events of Green Box and Blue Box and, after locating peers with similar conceptions of wonder, to collaborate in the design and production of materials for a school-wide wonder event.

The planning of the event was posited on uncertainty. Mr Oak was away on a school exchange visit to Africa. I had not been able to make contact with his replacement, and would have to rely on a conversation on the day. Arranging the day had been entrusted to the teachers in charge of the other two year classes. I had the opportunity to express my wishes to them during the trip to Wollaton and had followed this up with an email. They voiced uncertainty at how much time would be available to me to run a workshop, but agreed to a day where I could come in and talk to all three classes. I thus needed to prepare a programme of events that could be compressed or expanded, according to an uncertain timetable. I knew the stages I felt were important: a review of the work so far; a mass surveying of ideas about wonder; and group work to prepare for the ‘grand finale’. I
felt grateful for my experience as a conjuror and mountebank, which afforded me a degree of preparedness, even appreciation, for this uncertain environment.

5.11.2 Objectives of the Indigo Box

Table 31. Goals and Corresponding Objectives for Indigo Box

<table>
<thead>
<tr>
<th>Goal</th>
<th>Corresponding Objective for Indigo Box</th>
<th>Indicators that Objectives Have Been Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 1: The Wonder Boxes enable an experience of wonder and wondering.</td>
<td>Objective 1: To provide pupils with a pursuit that affords the opportunity to consider and share their own conceptions of wonder.</td>
<td>Observation of pupils considering and sharing conceptions of wonder.</td>
</tr>
<tr>
<td>Goal 2: The Wonder Boxes enable a constructive exploration of wonder and wondering.</td>
<td>Objective 2: To provide pupils with a collaborative pursuit that allows their expression of wonder for sharing with a larger audience during a planned wonder event.</td>
<td>Observation of pupils working together on task to address the theme of wonder and wondering.</td>
</tr>
<tr>
<td>Goal 3: The Wonder Boxes enable the propagation of wonder and wondering.</td>
<td>Objective 3: To provide pupils with impetus to continue designing wonder materials for a planned wonder event.</td>
<td>Consideration of work produced by pupils for the wonder event.</td>
</tr>
</tbody>
</table>

5.11.3 Design: Stages of Indigo Box

Planning for Indigo Box was a test of ‘metis’, or cunning intelligence (Detienne and Vernant 1991). I knew the day I would be going into the school, but not the time or timing. Mr Oak was away on an exchange visit to Africa: my contacts were now Mrs Rose and Mrs Vine, the teachers of the other two Year 5 and 6 classes. In correspondence via email they were generous in their assistance, offering me the school hall for working with the pupils. They would not be clear until the day, however, of the start or end times, or how long we would have. The hall would need to be cleared at lunch time for school dinners. Beyond this I would have freedom to work with the pupils as I wished.

I planned that the first stage would be similar to an assembly, with me addressing the pupils, asking them about their memories and ideas, providing my own show-and-tell in
the form of an optical illusion, and announcing the challenge of the school Wonder Show. I then worked out a way of allowing teams to be formed for the design and production of materials. Both stages could fit within any time space provided I got across the message, provided motivation, and facilitated interest group formation. The final stage of designing and making could fit any remaining available time, with my hope that teachers would be able to devote some time to the project in the week between the workshop and the show, and encourage pupils to continue their wonder work as homework.

**Table 32. The Stages of Indigo Box**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Reviewing</td>
<td>Thaumaturge and pupil year group consider the events of Green and Blue Box. The idea of a Wonder Show (White Box) is introduced.</td>
</tr>
<tr>
<td>Connecting</td>
<td>Pupils produce a display of conceptions of wonder which is used to assist in the formation of interest groups.</td>
</tr>
<tr>
<td>Designing</td>
<td>Pupils work in interest groups to design and plan materials for a proposed wonder event.</td>
</tr>
</tbody>
</table>

**Stage 1:** Thaumaturge and pupil year group consider the events of Green and Blue Box. The idea of a Wonder Show (White Box) is introduced.

This introductory stage reviews some of the earlier events in which participants have played a part: the Green Box ‘wonder smash’ and the Blue Box Wonder Visit. The thaumaturge asks pupils about their memories and presents a ‘wonder’, an optical illusion. The thaumaturge then announces the challenge: to put on a Wonder Show for the entire school to attend.

**Stage 2:** Pupils produce a display of conceptions of wonder which is used to assist in the formation of interest groups.

Pupils are asked to think about wonder – what they think it feels like and what they wonder about or wonder at. They are then given Post-It Notes and asked to write down their favourite idea. They are then given five minutes to affix the notes to a wall, and look at one another’s responses. Pupils are then given five minutes to form groups based on their shared wonder interests.
Stage 3: Pupils work in interest groups to design and plan materials for a proposed wonder event.

Materials are distributed to pupils (indigo coloured A4 paper, pens) who work in their interest groups to come up with ideas for the Wonder Show. Thaumaturge, teachers, and teaching assistants circulate to offer support. Once pupils have planned their exhibit, they are given access to craft materials to begin constructing.

5.11.4 Design: Apparatus

Table 33. Apparatus Used in Indigo Box

<table>
<thead>
<tr>
<th>(T) Used by Thaumaturge/Teacher</th>
<th>(P) Used by Pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Shrinking Illusion (T)</td>
<td>Demonstrating an example of wonder</td>
</tr>
<tr>
<td>Bell (T)</td>
<td>Announcing the beginning and ending of pursuits</td>
</tr>
<tr>
<td>Timer (T)</td>
<td>Ensuring pursuits run to time</td>
</tr>
<tr>
<td>Post-It Notes (P)</td>
<td>Writing individual conceptions of wonder</td>
</tr>
<tr>
<td>Indigo tinted A4 paper (P) with pens</td>
<td>Planning and designing exhibits</td>
</tr>
<tr>
<td>Assorted craft materials (P)</td>
<td>Preparing signs, forms, artefacts etc.</td>
</tr>
</tbody>
</table>

5.11.5 Acting: Account of Indigo Box in Action

Stage 1: Reviewing: Thaumaturge and pupil year group consider the events of Green and Blue Box. The idea of a Wonder Show (White Box) is introduced.

I arrived at the school for morning registration and visited each of the three classrooms. I was delighted to learn from Mrs Rose, who had kindly agreed to take on the responsibility for the project in Mr Oak’s absence, that we would be able to begin the session after registration. There remained some ambiguity about the afternoon – there were sports tournaments and music assemblies to plan – but I was pleased to go with the flow knowing that a couple of hours should be sufficient to set things going. Mrs Rose would be with me for the entire session, as would teaching support staff; Mrs Vine would need time to attend a meeting, but would offer support whenever possible. Mrs Leaf, who was
covering for Mr Oak, would also join in, although she was concerned that she had a plan of work she needed to cover with the class.

I had five minutes to prepare. I used the top of the piano as an impromptu table, laying out pens, paper, and optical illusion. My prompt card was simple:

- A.M. Reviewing Wonders: Feedback from Blue and Green Box
- The Challenge: What is a Wonder Show?
- Conceptions of Wonder
- P.M. Designing and Creating

I knew that there might not be a ‘PM’ and was prepared to ‘telescope’ events should this be the case. Mrs Rose arrived with her class and told me that she would be able to confirm the timetable for the day at break time.

The classes took their places as if at an assembly and I pitched straight in with a welcome. I asked the group what they remembered about their trip to Wollaton. I realised as the responses came in that I was at a disadvantage; I was not able to record the event, and would have to rely on my memory. When the first break for activity came along, I wrote down the responses I could recall:

‘We saw lots of different things, like stuffed animals and bees that lived in the ground.’

‘There was a man with a bell in a box and he took us round the hall and showed us strange exhibits.’

‘Corvus is Latin for crow.’

‘The bus was late.’

‘We had to draw a machine for wonder.’

‘We all met in the hall and showed our work and Chloe sang about wonder.’

One girl said, ‘It was like a dream.’ When I asked her later what she meant, during the design period, she said that the day was ‘strange, fun, and exciting because it was unexpected, and not a normal day.’

One pupil said ‘We thought it was a wonder how you made it all happen,’ and Mrs Rose added a vote of thanks, saying how enjoyable the day had been, and how the day itself was a wonder. The pupils applauded.
I then asked the pupils to think back to the first time we met for ‘wondering’. Linda and Fred were keen to review the Green Box happening, and talked of how they transformed their classroom into a ‘showroom’ (Henry again piped up with ‘It was a ‘Wonder Smash’) and how they set up tables of wonders for everyone to see. Mrs Rose asked what the visitors thought of the wonder smash. I wrote down four responses:

‘We came into the room and we were shown how to make cups from paper and then we had a drink.’

‘There was a table where we had to guess what was in the box.’

‘You learnt about the different senses.’

‘There were lots of wonders to explore.’

I then asked pupils what they had learnt and there was a lot of calling out. Some of the suggestions were: how to make paper cups; about the senses and how there were more than five; that the sun is a star; and what fossils feel like. I then asked pupils what they thought wonder was. Encouraged by Mrs Rose, pupils put their hands up. There were a range of responses: ‘weird’, ‘interesting’, ‘when you want to know more’, ‘black holes’, ‘babies, because how do they grow?’

It was time to capitalise on this enthusiasm, and I announced that we would be creating another wonder event, and this time we would all be setting up stalls, and transforming each of the classrooms, which all the school would come and visit. The audience seemed very appreciative: there were exclamations of ‘Yes!’ and ‘Cool!’ and pupils began discussing ideas. I heard one girl say to another: ‘Let’s do rainbows.’ When peace was restored, I revealed that we had just one week to prepare, and that the next wonder show would take place in a week’s time. We would need to think about our ideas of wonder, which was where the next activity would be useful. First, however, I wanted to show everyone something that made me wonder: an optical illusion. I performed Bruce Kalvert’s Growing Head Illusion, where a spinning disk causes the audience to see the performer’s head expand and mutate. As I often find, the illusion drew gasps and laughter from the audience. I asked pupils why I chose this illusion as an example of wonder: again, there were lots of ideas called out, some descriptive (‘It made your head big’) some thoughtful (‘when it spins, your brain is confused’). Pupils identified that it was wonderful because it was ‘surprising’, ‘funny’, ‘weird’, ‘made you wonder how it works’, and ‘magical’. I added my own thoughts – this demonstration was a thing of wonder, not
only because it is surprising and not something you see very often, but because scientists were still not quite sure how this particular illusion works.

**Stage 2: Connecting:** Pupils produce a display of conceptions of wonder which is used to assist in the formation of interest groups.

I asked pupils to think about wonder, and to ask themselves these questions:

‘What does wonder mean to you?’

‘Can you think of something wonderful?’

‘What do you wonder about?’

I told the pupils they had three minutes to think about these questions, but were not to share their ideas. I walked across to the piano and collected the Post-It Notes and pens, and looked at the back wall as a place for pupils to ‘post’ their ideas. As I looked at the wall my eye was drawn to a vaulting horse, and it occurred to me that this was the ideal receptacle for the pupils’ ideas: it could be wheeled out onto centre stage, and pupils would be able to access its four sides. A ‘wonder horse’, no less (Figure 20).

While the pupils were thinking, I took an extra couple of minutes to take up my note book and write down some of the answers they had provided. I then wheeled across the vaulting horse. I congratulated the pupils on their quiet wondering, and told them about the next stage: each pupil would be given a Post-It note upon which they could write their idea of wonder. They were not to consult or copy each other. When pupils had written down their idea, they were free to walk up to the horse and add their wonders. When they had done this, they could sit back down again.

Pupils seemed keen to look at the wonders being posted on the horse, and rather than sitting down again, gathered around the locus of wondering. I let this be for a few minutes, keen to see what would happen. Some pupils seemed to take on curatorial roles, aligning the notes and, I noticed, grouping like responses with like. I could see no sign of copying—pupils appeared to be writing their responses away from the horse, as instructed, sitting on the floor, overseen by Mrs Rose, Mrs Leaf and the teaching assistants.

When all pupils were gathered around the horse, I took a step back to the piano and rang the bell. I asked pupils to join me, where we had a good view of the horse, and announced the next part of the challenge. Everyone had five minutes to look at the horse, to get some ideas about wonder. They were free to go with their own thoughts, or to choose another
idea; all they needed to do was to find people that they shared ideas of wonder with, and then to sit down in the group. Pupils were allowed to call out their ideas of wonder, to see if they could find their partners.

Pupils were then given five minutes to circulate around the Wonder Horse and the Hall, considering the responses and seeking others who shared their thoughts about wonder. There was a lot of activity around the Wonder Horse as pupils inspected the labels. Some pupils were calling out their interests. Several boys were shouting ‘Magic’; I watched as five boys grouped together to talk about tricks: it appeared to me that they had not shared their interest before. There was an escalation in noise as more pupils took to calling out: I could hear ‘Dinosaurs’, ‘Black Holes’, and ‘Flowers’. There was a lot of noise as pupils began to form small groups. There were other tactics for advertising interests: I saw Linda holding up a piece of paper upon which was written ‘Bees’.

As groups were formed they moved away from the Wonder Horse, assisted by the teachers and teaching assistants. I rang the bell after five minutes, by which time the majority of pupils had formed small groups. Those that had not formed groups were given another two minutes and were guided by the staff.

![Figure 20. The Wonder Horse](image)

**Stage 3: Designing**: Pupils work in interest groups to design and plan materials for a proposed wonder event.

Pupils had formed groups that were distributed around the school Hall. I rang the bell and, with ushering from staff, pupils regrouped around the Wonder Horse. I asked if everyone had found a group; there was a lot of clamour. I asked who had not found a group. Several hands went up. Mrs Rose announced that whoever had not yet found people to work with would be helped afterwards. I then asked what groups we had, but asked for pupils not to call out. I pointed at a few faces in the crowd and received responses: ‘crystals’,

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‘illusions’, ‘bees’. When ‘bees’ were announced, Linda announced that she had also formed a bee group. Mrs Rose told her that she would have to find something else. She added that groups would have to consist of boys or girls from the same classroom, as the displays would be prepared in class and there would not be enough time for classes to work together. There was a protest from a group of boys, who began to talk about working with fossils together. Mrs Rose silenced them and told them she would discuss it with them during break time.

As break time was approaching, I thought it would be counterproductive to begin the next stage. Instead I told the group what would be happening next: each group would be working together to come up with ideas for their wonder displays. What did pupils think was necessary for a wonder display? I noticed that members of Oak class were quick to put up their hands and wanted to hear their recommendations. I took some rapid-fire responses:

Albert: It should appeal to an audience.
Laura: The audience should be controlled... like we should help them move around.
Kelly: It should be fun.

Rory: It should be informative... people should learn new stuff.

Pupils from the other classes were putting their hands up: these pupils had been the demographic for the Green Box ‘wonder smash’ and I was interested to hear their thoughts:

‘We should have lots of hands-on displays.’

‘It can help us learn by showing us stuff we have never seen before.’

‘We could give prizes for people who come to the wonder tables, like stickers and sweets.’

The school bell rang for break time. I asked pupils who had made suggestions about the show to wait a few moments so that I could write their ideas down. There was a rush of activity and I could hear Mrs Rose remind pupils about their behaviour. The throng of pupils with ideas was overwhelming, and I hastily wrote down their ideas. Pupils seemed keen to talk about their ideas – I told them we would have time after break to do this. Mrs Rose cleared the Hall and dispersed the group around me. I took myself into a corner and
wrote down my notes and observations. Towards the end of break time, Mrs Rose brought refreshments and told me that we would have the afternoon to continue the work.

After break time, pupils took their places as they had at the beginning of the morning session. I had put materials (indigo paper and pens) on the Wonder Horse. I briefed the pupils to work in groups and come up with ideas for their displays and told them that I would be circulating with the teachers and teaching assistants to provide help and discuss ideas.

Pupils seemed to settle down to work quickly. They formed clusters on the floor; some groups talked about their ideas. Others seemed to begin work straight away. At the beginning I found myself managing groups that were working too close together and impinging on one another’s space. I encouraged them to move to allow themselves room to work (Figure 21).

Linda and Lauren told me they were disappointed that they had been told that they could not produce a bee-themed stall, but decided they would set up a display combining ‘cars of the future’ and music.

A group working on fossils asked if they could use the IT suite to research and prepare a PowerPoint presentation; this was agreed to by Mrs Rose. Another group working on the solar system asked if they could do the same. Two girls told me they were interested in how people grow and asked if they could use the Library to look for books.

Figure 21. Pupils at Their Wonder Work

After lunch, work resumed. I had a conversation with a boy who decided that he no longer wanted to work with the group of magicians. He wanted to work on his own. He had prepared a list of the tricks he could do. I suggested he wrote a list of the props he would need. He later came back to me with the list (glass, water, pen, coins, rubber bands) and
showed me some publicity materials he had produced for the classroom, announcing ‘The Great Mysterio’ and free displays of magic.

It was interesting to observe the many way the pupils worked. As I had seen in Yellow Box, some groups were conducted or managed by a pupil who oversaw the work. Other groups appeared to operate by pupils pooling the work they had produced. There were different approaches to research. I listened to the fossil group discuss categories of fossils, and tasking different members to procure specimens and related information. Henry, Rufus, and Owen sat and discussed famous mysteries they knew of, and Rufus wrote them down as a checklist. Later Rufus prepared a prototype factsheet on the ‘Philadelphia Experiment’, which ends with a note ‘Need to research Philadelphia experiment further’ (Figure 22).

![Figure 22. Preparatory Work for 'Mysteries' Display](image)

With an hour left to go, the ream of indigo paper had been used up. I asked Mrs Rose if we had access to any other materials. The ‘art cupboard’ was opened up, and a selection of paper and cardboard was brought into the Hall. Mrs Vine returned with a selection of fabric for pupils who wanted to think about draping their table. I saw a group of pupils making a mobile representing the solar system. Groups asked permission to visit the IT Suite and the Library. I noted that rather than spend their time working ‘off site’, pupils returned to the hall with materials they needed. It was also evident that pupils were going
to their class rooms to collect objects and artefacts: the fossil group had assembled some ammonites; another group had procured a world map (Figure 23).

![Image of objects and artefacts]

**Figure 23. Work in Progress, showing use of school materials**

The last fifteen minutes of the afternoon were devoted to discussion about what was necessary for the show next week, and time management in the interim. Mrs Rose told her class that there would be one more making session later in the week; otherwise pupils needed to work as teams and find and make materials as homework.

Pupils made requests. One girl wondered if anyone could supply her with cardboard boxes for her exhibit; a boy asked if anyone had any strange fruit in their fruit bowl. Several pupils called out that they had boxes and fruit and would bring them in. The group of girls who were producing a display about optical illusions asked if they could borrow my Shrinking Head illusion. I had to think on my feet here: although I wanted to help pupils produce good displays, I was not keen on lending conjuring apparatus, if only because this could be construed by pupils as favouritism. I told the group this, but added that I would look for things that weren’t magic tricks. Rory asked if I had any rocks or fossils.

### 5.11.6 Observing and Reflecting: Evaluation of Indigo Box

**Objective 1**: To provide pupils with a collaborative pursuit that affords the opportunity to consider and share their own conceptions of wonder.

The events of Indigo Box were collaborative on many levels: teachers worked behind the scenes to allow the day to happen within the many needs of a school day; I worked with teachers to ensure that I could fit with the school day; pupils worked together to begin the production of a wonder whom. Good luck played an important part – the kindness of teachers, the excellent behaviour of pupils. But ‘fortune favours the prepared mind’ and
my previous experience as a magician, accustomed to working on the fly and being opportunistic, was a boon.

The preparation chiefly ensured that I had both adequate pursuits and materials, suitable for any given amount of time. It was important, I felt, to draw on the energy of previous experiences, hence a review of Green and Blue Boxes, and to motivate by sharing my own thoughts about wonder. Pupils had positive memories of the ‘Wonder Smash’, recalling experiences of mystery and fun, and announcing that they had learnt about things (the senses, the solar system); the trip to Wollaton had, it seemed, been a diverse experience, with pupils recalling the tour of and events within the Hall, as well as information and incident. I wished I had more time to draw out these wonders, to both assist me in evaluation, and to assist pupils in reflecting and planning. Perhaps, however, cutting the day free from overt feedback and evaluation had added to its reported ‘dream-like’, fun, and unexpected qualities.

The Wonder Horse was an unplanned success. I had anticipated using a wall in the school hall, and came prepared to establish a ‘Wonder Wall’ with the pupils, wherever I could discern a gap. It was only in the moment that I noticed the vaulting horse and saw its potential. Having a four sided object in the centre of the hall allowed pupils to circulate around it, creating a ‘market place’ for wonder and allowing an exciting place for the exchange of ideas. The 146 examples of wonder and wondering catalysed by the Wonder Horse exercise ranged from the profound to the trivial, the serious and playful. Both misconceptions and learning were displayed in an accessible register of interests.

**Objective 2:** To provide pupils with a collaborative pursuit that allows their expression of wonder for sharing with a larger audience during a planned wonder event.

The pupils were quick to form collaborative interest groups. I was unable to ascertain to what extent these were ‘friendship groups’, and perhaps this does not matter. I was witness to the fact that some pupils discovered interests they did not know they shared, in the case of conjuring. The fossil group consisted of boys from two classrooms working together, but otherwise, in the interests of practicality, Mrs Rose requested that groups be formed within classes. Thus one group was denied the opportunity to set up a display about the wonder of bees. However, Linda and Lauren proved able to diversify. There would have been benefit in laying down the working-within-classes rule at the beginning of the session in order to avoid potential disappointment or conflict.
Pupils appeared to work seriously throughout the day without abusing the freedom given to them. On my tours of the groups I observed that the IT facilities were used for structured working, with two groups of pupils discussing their slideshows and inputting text they had prepared on indigo paper. I did not visit the library, but noticed that pupils were sent there to retrieve books, which they then brought back to the hall. Rather than an excuse to disperse, it seems that individuals had been tasked to find information for the benefit of the group.

It was clear that pupils had different ways of working, and testified to wondering about and feeling wonder for many different things.

**Objective 3**: To provide pupils with impetus to continue designing wonder materials for a planned wonder event.

To what extent was the event able to generate continued motivated work from the pupils? Mrs Rose and Mrs Vine told me that they set aside time during the school week to continue the work, and that some pupils were working on their projects at home. Mrs Leaf, the supply teacher for Oak, told me on the day of the Wonder Show that she had not used classroom time for the development of work: she was working to a scheme of work provided by Mr Oak before he went to Africa. Thus the wonder experience provided by Oak in White Box can be considered an example of what pupils might produce without guidance from a teacher, and a reflection of their own nurturing of the project.

**5.12 White Box: The Wonder Smash**

**5.12.1 Introduction**

I envisioned the White Box as a grand finalé to the Wonder Box invention. I saw it as a blend of multiple traditions of wonder as rooted in the interactive spectacle: the show or sideshow; the Cabinet of Curiosities; phantasmagoria; and Happening. The closest school tradition, the Science Fair, might be discerned in the mix, but the contents would range beyond the remit of scientific subjects and practice. For Oak class, the event would be a potential summation of the explorations triggered by the Black Box, with the option of bringing together practices established via the sequence of pursuits (e.g. collecting and presenting; Object Lessons and Nature Tables). I use the words ‘potential’ and ‘option’ aware that pupils were given free rein in their choices during the design stage (Indigo Box), and were not required to revisit any previous work. I was hoping for an unforced experience, rooted in self-selected interest and activity.
Another feature of this finalé would be the increased number of participants. The pursuits of the boxes had expanded to allow participation from the entire year group (Rose, Vine, and Oak classes) at the conclusion of the Green Box. The three classes would now be working together to put on an event that would involve the whole school.

Although a finalé, I did not want this to be a final act of wonder and wondering. Hence the propagative goal remained. I wanted to enable an event that would be a touchstone for participants, a memorable occasion that pupils would return to in their imaginations. I anticipated that a return to the school several months after would provide me with an idea of whether this wish had been granted, when I would have the opportunity to talk to stall holders and audience members.

5.12.2 Objectives of White Box

Table 34. Goals and Corresponding Objectives for White Box

<table>
<thead>
<tr>
<th>Goal</th>
<th>Corresponding Objective for White Box</th>
<th>Indicators that Objectives Have Been Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 1: The Wonder Boxes enable an experience of wonder and wondering.</td>
<td>Objective 1: To provide pupils (stallholders and visitors) with a collaborative pursuit that affords the opportunity to explore and express their conceptions of wonder.</td>
<td>Observation of pupils and consideration of work produced and experiences offered.</td>
</tr>
<tr>
<td>Goal 2: The Wonder Boxes enable a constructive exploration of wonder and wondering.</td>
<td>Objective 2: To provide pupils the occasion to create a shared celebration of wonder and the wondrous.</td>
<td>Observation of pupils and consideration of work produced and experiences offered.</td>
</tr>
<tr>
<td>Goal 3: The Wonder Boxes enable the propagation of wonder and wondering.</td>
<td>Objective 3: To provide pupils and staff with inspiration to continue working with wonder.</td>
<td>Interviews with pupils after the event.</td>
</tr>
</tbody>
</table>
5.12.3 Design: Stages of White Box

As with Blue Box, for White Box I broke with the three stage structure. The last stage of Indigo Box, ‘Designing’ would, I hoped, be continued by pupils in their preparation for the White Box show, with the support of teaching staff. The two stages of White Box, ‘Transforming’ and ‘Celebrating’ were to grow from this work.

Table 35. The Stages of White Box

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transforming</td>
<td>Pupils, assisted by teachers, staff, and thaumaturge, transform their classrooms into wonder spaces and prepare for visits from all pupils and staff of the school.</td>
</tr>
<tr>
<td>Celebrating</td>
<td>The wonder spaces are visited by all pupils and staff of the school.</td>
</tr>
</tbody>
</table>

**Stage 1: Transforming:** ‘Pupils, assisted by teachers, staff, and thaumaturge, transform their classrooms into wonder spaces and prepare for visits from all pupils and staff of the school.’

Pupils, assisted by their form teachers and teaching assistants, and with support from the thaumaturge, work together to convert their classrooms into interactive display spaces and consider the experience for their visitors. Materials generated during Indigo Box are used, but work that has been created before and after this module is welcomed. Pupils are responsible for their own realms within the classroom, whether this be a table or doorway. Teachers draw up a timetable which allows all year groups to visit.

**Stage 2: Celebrating:** ‘The wonder spaces are visited by all pupils and staff of the school.’

Over the space of an afternoon, classes take it in turns to experience the shows that have been prepared for them.

5.12.4 Design: Apparatus

For this event, the majority of the materials were provided by the pupils and the school. As mentioned in the previous section, I agreed to contribute materials requested by pupils, provided these items were not conjuring props. I brought in a bag of ammonites, an old
dictionary, a dragon fruit (*Hylocereus undatus*), two metal canisters, and a black cloth, items requested by pupils at the end of the Indigo Box day.

5.12.5 Acting: Account of White Box in Action

Stage 1: Transforming

I arrived at the beginning of the school day, prepared to be both collaborator and observer. In communication with Mr Oak, who had returned from Africa two days previously, and Mrs Rose and Mrs Vine, we worked out that the morning session, from 9am till 12.20pm, would be time to prepare the classrooms, make any materials needed (such as posters, signs, and tickets), draw up a timetable for visiting, and brief all teachers and teaching support staff.

Work began after morning assembly. I visited each of the classrooms in turn, with a view to being helpful, and to observe work in progress. The remit had been kept deliberately open: I felt it was important, as throughout the project, that there was space for multiple conceptions of wonder and wondering to emerge.

How were the classrooms ‘transformed’? In the first instance, classroom doors, the thresholds of the wonder rooms, were considered in each case. Oak bore a welcome sign. Vine had three signs advertising three of the stalls within and welcoming visitors. Most elaborate of all, Rose had a curtain upon which were pinned large question marks.

The entrance to each classroom was different, necessitated in part by the different layouts for each room. With Oak, the visitor was pitched straight into the experience. With Vine, there was an approach through the cloakroom, where notices advertising stalls were positioned. With Rose, again, most elaborately, there was a table upon which a music player was positioned, with a sign asking visitors if they recognised the music. This was opposite a refreshment stall, with, as in Oak’s Green Box event, origami cups.

Within, the walls and notice boards were used either by the stalls that were set up in front of them, or, with spaces not aligned to stalls, used to advertise stalls to be found within the room. In the case of Rose, the windows were used to promote wonder and wondering. In Oak, the blinds were drawn to promote mystery – as, I noted, I had done in the Black Box inception event.

Furniture was rearranged. Two configurations were in evidence. In Vine and Oak, all stalls were set up at the periphery of the classroom, as had happened for Green Box. In
Rose, there were tables positioned in the middle of the room. A display stand, curated by
the teacher, presented visitors with a selection of curios inviting pupils to identify them.

Classroom materials were incorporated in such a way as to render them ‘other’. Books
were presented on wooden rests (the fossils stand in Vine) or propped up with plastic
spiders on them (the animals stand in Rose). Maps were incorporated into displays – with
sticky labels (the dinosaur stand in Vine) or annotations in pen (the mysteries stand in
Oak). In Rose, the whiteboard was used by the Universe stall which had been set up in
front of it, displaying a map of the cosmos. In Vine, three magicians had set up a table in
front of the board but the board showed a screensaver. In Oak, the board was behind the
teacher’s desk and ‘outside’ of the magic circle. In Vine, existing classroom displays were
incorporated or reconsidered as part of the experience. An advert drew visitors’ attention
to a display about the Ancient Greeks.

It was clear how important teacher involvement was to the activities between Indigo Box
and White Box. Mrs Rose’s class had devoted several sessions to planning and designing.
Of the three classes, this was the most ‘polished’. When I arrived, most of the materials
had been produced, and focus was on the set-up of the room. Mrs Vine’s class had spent
preparation time, although Mrs Vine had been away on a training course. Pupils had
prepared materials for homework. Mr Oak, being away, had not set preparation work. I
ascertained from Linda and Laura that pupils had asked their supply teacher for time to
devote to wonder, and had been allowed to make materials during a morning lesson.
Pupils had taken responsibility for bringing in exhibits: Linda and Lauren had brought in
model cars and musical instruments, Laura and Fred had brought in modelling clay and
scent bottles, Lily and Kelly had brought in drinking straws and dried peas. All written
materials were to be made in class by pupils before lunchtime. This meant that there was
considerable energy being devoted to making signs (drawing, writing, and cutting out)
and an atmosphere best described as a ‘flurry’.

I was told that the responsibility for the smooth running of the event had been given to
Mrs Rose. She had drawn up a timetable which allowed each class in the school to visit
each of the rooms in turn. Teachers were allocated thirty minute blocks in which to visit
the three classrooms, meaning that visits to each classroom would have to be limited to
ten minutes. Mrs Rose told me each teacher had been given a copy of the timetable, and
had been briefed to work strictly to time.
My wish for the day had been to say ‘yes’ to everything, from pupils’ ideas for their stalls, or teachers’ organisation of the staging of the event. This, I felt, would allow pupils to express themselves fully, and to allow teachers necessary control. Despite this intention, there was one occasion when I elected to influence the development of the event. I was concerned that pupils were becoming rather frantic in the quest to create a ‘reward point’ scheme, and felt it might occlude the day. I found myself giving an impromptu talk on ‘intrinsic’ and ‘extrinsic’ motivation to Oak, leading to a discussion where Alex and Megan told me they could see the point, and that it would be much better for visitors to want to see the displays, rather than want to visit with the intention of collecting stickers. It was an extempore address, delivered when I felt concerned that pupils were becoming distracted from the preparation of the event itself. I was unable to talk to the other two classes about my concern.

Stage Two: Celebrating

‘It was immediately obvious that there was a buzz of excitement in many parts of the school (the Wonder Day had spread into the hall and several classrooms). I was greeted by many excited children, eager to show me what they had to offer.

‘To credit of all concerned a great deal of effort had gone into presenting something resembling a school science fair but whose scope went beyond into intriguing areas of mystery, magic and the natural world. I was invited to examine fossils and crystals, try quizzes, play games, decipher codes, listen to music (and join in)... in short, to do and learn...It must have been a splendid learning experience.’ (Visitor Report, Denny Plowman)

I had not foreseen quite how full of wonders, or ‘wonderful’, the White Box event would prove to be. I was glad that I had invited two outside observers to visit and comment on the event, as there was much to experience and consider. The observers – my supervisor, Shaaron Ainsworth, and Denny Plowman, the museum officer who had been part of the Blue Box experience – were given free rein to circulate, and produced reports after the event.

A large variety of subjects were represented, the majority of which were ‘grown’ from the ideas added to the ‘wonder horse’. A representative illustration of range can be provided by a list of the stalls set up in Oak class: war, space, senses, words, colour, music, cars,
mysteries. Furthermore, two stalls offered games (a guessing game and a game of skill) and one pupil moved around the room as an ‘oracle’, inviting visitors to ask her questions.

All stalls provided an interactive experience. The simplest interaction was provided by an array of objects and explanatory material. Visitors looked at the materials, and stall holders were present to ask or answer questions (e.g. Flowers (Rose)). Some stalls asked direct questions of visitors via signs, and visitors were required to provide answers or ideas in writing (Mysteries (Oak)) or via ‘suggestion’ boxes. Finally, other stalls presented direct challenges to visitors in the form of guessing games (counting games: Quantity (Rose)) or feely boxes e.g. Mystery Boxes (Vine).

Figure 24. Wonder Room 1: Oak
Figure 25. Wonder Room 2: Rose

Figure 26. Wonder Room 3: Vine
Although each classroom was unique, they all shared the characteristic of activity, with many claims to a visitor’s attention, whether this be via signs, or pupils as agents, or the number of displays within (Figure 24, Figure 25, Figure 26). I was interested to see how the classrooms were organised for visitor experience. As the transformations of the classrooms indicated, pupils had considered the use of the entrance to the classroom to welcome and promote, and in the case of Rose, to offer refreshments. I noticed, however, that some of these were neglected by visitors in the wealth of stimuli as pupils pushed into the room to investigate what was on offer. Fortuitously, the timetable allowed stallholders to address the issue of flow; I noticed that the role of docent or greeter was taken on by a magician in Vine and a pupil from the refreshment stall in Rose. It was different in Oak, where pupils called out to visitors, advertising their wares.

Iteration could also be seen in the pupils’ adaptation of materials over time. This could be occasioned by clarification. For example, a number of signs were amended (‘Remember to write your name’; ‘Feel free to turn the page’). Several stalls produced materials to improve the look of the display: Cherry and Megan produced a banner for their Space stall (Oak); Frank and Rory went on a search for boxes which they placed under their tablecloth to elevate choice fossils.

Pupils clearly realised the importance of communication with their audiences, and a number of stallholders told me they had grasped the need for differentiation for year groups. Lucy told me that Oak’s Space stall was set up ‘so different years could see different things.’ Rose was surprised that ‘some Year 4s didn’t know the colours of the rainbow, which led her to devise a worksheet and information sheet.

For some pupils, the educational experience appeared to be important to the interaction. I witnessed pupils teaching pupils at the Space stall and Illusion stall (Vine), the Colour and Sense stalls (Oak) and the Size stall (Rose). Hugo at the Mystery stall (Oak) greeted visitors with the question ‘What would you like to learn today?’

Observing and Reflecting: Evaluation of White Box

**Objective 1:** To provide pupils with a collaborative pursuit that affords the opportunity to explore and express their conceptions of wonder.

There can be no doubt that pupils were able to use the experience to represent their conceptions of the wondrous: the Wonder Rooms were busy with enacted wonders. When questioned, no child appeared to be at a loss to explain why or how their stall was an
expression of wonder. I asked stallholders how their displays had wonder in them: ‘Because all these mysteries make you think’; ‘All of space is a wonder’, ‘We wondered how you grow, and why people developed and how hormones work’, ‘(With optical illusions) you wonder what you’re looking at’.

Did pupils experience wonder in the production of wonders? Some pupils expressed their intrigue, or puzzlement, or delight, as they prepared their stalls. I expected to find this at Vine’s Optical Illusion stall. Mary, one of the curators, remained baffled, but delighted, by a rotating circle illusion, and told me she wanted to learn more about how the brain works. I also sought to find out more from the less obviously ‘wondrous’ displays, and was provided with responses that left me without any doubts as to the sincerity of the stallholders’ ‘sense of wonder’. For example, Ben and John’s display about War was motivated by their surprise that the world was once as it was, and that people dressed differently, and transport was much less sophisticated. Ben was wide-eyed as he showed me pictures of civilians in the fashions of the last century. Later I watched as he showed these images to Year Three pupils, who seemed to marvel that ‘ordinary people’ (their term) looked so ‘weird’ and ‘different’.

As a visitor/participant, I can attest to feeling wonder at some of the themes pupils were asking me to consider (the Solar System; dinosaurs; senses). This was augmented by admiration at the pupils’ industry or insight, and astonishment (I was fooled by a magician, and tricked by a guessing game).

**Objective 2**: To provide pupils the occasion to create a shared celebration of wonder and the wondrous.

After the event, on my journey back to the University, I took out my notebook and attempted to encapsulate the day:

‘Pupils came up with an impressive cornucopia. There were stalls devoted to fruits, optical illusions, the senses, colour, growth and hormones, music. Stallholders offered games (feely boxes; pea counting), competitions (puzzle-solving; designing); experiences (tasting strange foods; watching conjuring demonstrations) and tokens (collectable stickers, badges). Information was bountiful. Stalls offered up items for examination, information to read, and often both. The range of novelties, surprising facts, questions, mysteries, and jokes was enlivening. Even the refreshments were unearthly.’
Clearly, the occasion for creating a shared celebration of wonder had been provided and resulted in much work being produced. Beyond the establishing of an event, what factors enabled or supported the pupils’ constructions? Three key factors can be identified: the influence of teachers; prior experience provided by the Wonder Boxes; and the environment of pupil co-construction.

The influence of the pupils’ teachers were different for each class. After Indigo Box, Mrs Rose had timetabled several lessons for planning and making. She had constructed her own display of curios, placed at the centre of the class. Mrs Vine had given her class an afternoon to produce materials, and made wonder the focus of homework. Mr Oak had been away, and pupils had been left to work under their own initiatives.

These different situations resulted in different aesthetics for each of the classrooms. This was remarked on by Ainsworth, who made this a focus of her report:

‘Room 1 (Rose): Striking aesthetic in this room. Displays organized throughout room with much attention paid to the organization of exhibits of the desks, the look of each component, even the entrance to the room... This feels like a museum.’

‘Room 2 (Oak): First impressions: drab in comparison to Rose. This feels like a classroom. Teacher has been away so says the process has been rushed and this does come across. Wonder if visitors will notice?’

‘Room 3 (Vine): Looks like a cross between a classroom and a museum but children don’t look like pupils. They are dressed up (like magicians) or wearing labels which explain their roles. Again, many displays are striking in their attention to look and feel.’

Plowman reflected in his report:

‘A trifling disappointment was that some of the presentations looked to be rather hastily put together. That’s probably because either I am out of touch with what children of that age can achieve or, more likely (I hope) that they were done in some haste as a great deal had been achieved in the short time subsequent to the visit to Wollaton Hall.’

It is obvious that time devoted to preparation had an effect on the perceived quality of the displays. On the morning of the event I witnessed pupils in Oak class hurriedly cutting up paper and drawing charts. Pupils were telling each other to hurry. In contrast, in Rose class, music was playing and pupils were setting out preconstructed materials, under the
guidance of Mrs Rose. Vine was a mixture of frenzy and calm: all pupils had brought in objects and artefacts from home, but not all pupils had completed their signs. Despite concerns of disparity, the aesthetics of the rooms might not have affected the experiences adversely. Ainsworth noted:

‘My worry that (Oak) is drab in comparison to the other rooms in no way seems to register with the visitors.’

It seems that the most important factor was the energy of the pupils, and that this transcended any aesthetics. I watched Wallace entertain his visitors with a sheet of paper and an object lesson of rocks and minerals. Pupils were as rapt here as they were when encountering a velvet covered table and an arrangement of scented flowers. Thus, though teachers’ timetabling of preparation affected the ‘look’ of the different rooms, the visitor experience was not necessarily marred by ‘drab’ or ‘hastily prepared’ materials.

To what extent did the pursuits of the earlier ‘boxes’ have an influence on or prove useful? Both the processes and the products of these modules could be seen on the day. For example, several of the boxes appeared to inform both the displays and the activities:

Black Box: Visitors are asked for their conceptions of wonder.

Black Box and Red Box: Visitors are asked to guess the contents of a box or a bag.

Yellow Box and Green Box: Pupils create informative arrays.

Blue Box: Materials collected at Wollaton Hall. Materials connected to site (photographs; postcards; natural materials such as branches) and materials obtained from the gift shop (fossils, plastic dinosaurs).

Several boxes (Red, Orange, Blue, and, directly, Indigo), provided pursuits which focused on seeking and finding, and could be considered as helpful for the generation of materials.

The experience of Green Box remained in the minds of some of the stall holders I talked to on the day. For Oak, holding a prototype display, meant that some pupils had a good idea of how to welcome and communicate with an audience.

Laura: I’m happier with this stall than with the last stall in that it’s a lot more interactive, I feel happier about it.

For pupils in Rose and Vine classes, the experience of Oak’s earlier Cabinet of Curiosities was clearly an influence. Two boys in Vine set up a stall inviting visitors to taste the
difference between salt and sugar; a girl in Rose told me she had been inspired by Megan’s mystery box game.

Perhaps the most important factor for the success of the event was simply the interaction between pupils. Interest groups had been established during Indigo Box, and this shared focus appeared to generate an energy which transcended both teacher management or prior experience provided by the Wonder Boxes.

In the run up to the event, I had not set out rules for the day, other than the addressing of wonder and the care of visitors. It was therefore gratifying to see that pupils took on the roles of educators, either explicitly (creating information booths) or emergently, as in the case of Rose as she came to realise gaps in her visitors’ knowledge.

As for the issue of extrinsic motivation, the collection of tokens did not appear to me as an observer to be the focus of pupils’ movement through the rooms. I asked several pupils about the cards they were holding, which had been issued by a stall in Rose class. ‘It’s nice to know when you’ve visited a stall,’ said a girl in Year Four, ‘but I keep forgetting to ask.’ She then told me how it did not matter: ‘There’s lots of other stuff to do’.

**Objective 3**: To provide pupils and staff with inspiration to continue working with wonder.

The White Box event was the fruit of the process of pupils wondering about wonder. To continue with the propagative metaphor, I hoped that this fruit would produce seeds. Conversations I had with stall holding pupils during the event gave me some confidence that this process had been engaging and motivating, and there were indications that some pupils would continue to do this:

‘I love wonder. I asked my Mum and Dad to look out for wonder, so that we could make wonder displays in our house.’

‘This weekend I’m going to be looking for wonders when I go to my Auntie’s.’

Several teachers told me they were inspired by the work that the children had produced. A teacher of a Reception class (ages 4 to 5) told me that she wanted to run a number of projects based on what she had seen. Next term, she had decided, she would ask her pupils to produce a display of wonders based on what they had experienced. A teacher of Year Three approached me and told me she was feeling extremely emotional: a boy she had found extremely hard to reach had revealed his great interest in dinosaurs and fossils.
Now she knew his interests, she would be able to assist him reach his potential, by allowing him to prepare project work and by setting him themed challenges.

The headmaster asked if I would be returning, ‘because the work the pupils produced was astounding.’ Mrs Rose sent me suggestions for another wonder event, with expanded displays of mysterious artefacts. Pupils asked me in the playground if we were going to put on another show. I wished for the opportunity to extend the research.

Pupils must have come away from the Wonder Show with a multitude of conceptions. It is not possible to tell whether these are changed or new conceptions arising from the event: a pre-show questionnaire would have proved illuminating. Nevertheless, they attest to the vast potential source of interest and positive affect that can result from the exploration of wonder as a subject, and the desirability for the direct enquiry and manifestation.

A striking example of propagation occurred within a day of the White Box event. Mr Oak suggested continuing the experience by setting up a dedicated web forum on the school server. This could be accessed by Oak class, and I would be granted access. This was an unseen development which struck me as an ingenious use of existing school resources. How this initiative developed will be described and discussed in the next section.

5.13  Coda: A Virtual Wonder Box

On the day of the White Box Wonder Show, Mr Oak asked me what I thought about the idea of a school web forum devoted to the Wonder Project. It would be accessible by Oak class, who could use it as they wished. I would also be able to access the forum. I thought this was an excellent idea – an unexpected extension of the project, and one which met the goal of propagation. My sole concern was that I did not take on the role of moderator. I felt this could occlude pupils’ initiative: I wanted this to be a space for democratic wonder. I also wondered what would happen if pupils were given free reign to operate a wonder space. I asked Mr Oak to tell the pupils that I would not be checking the forum until the end of the school holidays.

The site was set up the next day, Friday 18 July, via the school server. Mr Oak told me he had informed the pupils of its existence, and they were free to use it as they wished. Eleven pupils accessed the site, both inside school time (the earliest post being sent at 13.33) and after school (20.28). It was clear that they saw the forum as a place in which to
keep in touch with me: all posts addressed me directly. Amongst the posts were encouraging signs of continued wondering:

‘We love wonder and are going to do wonder collecting this summer.’ (Linda)

‘I’m going to an air show tomorrow so I’ll see what wonderous things I can find there.’ (Fred)

Megan, writing at 19.18, wrote the longest message, incorporating evaluation of the project, the offer of more work, and the voicing of intention:

‘Everyone really enjoyed the wonder adventure. I loved Wollaton Hall. I’m sure everyone else did too. I was wondering, are you ever going to come back to our school to do another wonder session as they were really fun! Me and Anne have also got some work for you to take, we thought you might want to keep it. We forgot to give it to you when you left the other day. I hope you get to email us back soon, I look forward to hearing from you or seeing you soon. I will look for lots of wonderous things whenever I can.’

Four pupils sent messages the next morning, a Saturday, with the earliest sent at 07.14:

‘Hi Matt it’s Rufus in the morning thanks loads for the wonder adventure it was great r u coming back to our school again cos you must!!!!’

When I checked the account at the end of the holidays, I found that only two more messages had been left, at the end of July. I realised that twelve of the pupils would no longer had access to the account after Friday 18 July, as they would be leaving for secondary school. I felt regret that I had not made a point of visiting the forum on the Friday, to wish pupils good luck and thank them for their considerable inspiration.

A new wave of communications began at the end of September when three of the new Year 5 pupils of Oak began visiting. These pupils would have been visitors to the White Box Wonder Show. They, too, were keen to know if I would be visiting. Three pupils from Year 6 (Lauren, Rory, and Laura) joined in. Pupils were not interacting with one another, but continued to address me. I felt it was time to put in a virtual appearance and, keen to see if a forum post had the power to catalyse co-wondering, thought I would set a challenge:

‘This morning I saw something on my street that made me wonder and laugh. I wonder... can anybody guess what I saw?’

A Year 5 pupil, Joe, asked for a clue then, two hours later, posted his guess:
‘My guess is a cat sat on a car roof whilst the car was moving.’

Another pupil said that he had made the same guess. Laura posted ‘I HAVE NO IDEA’. Clearly encouragement was needed: I repeated the challenge, and promised to describe what I had seen after twelve guesses. Laura appeared a month after the post was first made (28 November) and offered eleven guesses:

1. A slice of bread with a flag in it. (Megan’s idea)
2. A bush outside a house carved into a wonder thingy. (My idea)
3. Ten caterpillars crawling across the street. (Megan’s idea)
4. Lucky heather?? (Dad’s idea)
5. A family in their swimming costumes. (My idea)
6. You saw a stop sign with a face banged into it. (Megan’s idea)
7. People that looked like John and Edward. (My idea) LOL!
8. A shoe tied onto a lamppost. (Megan’s idea)
9. Someone sleep walking with his pyjamas on. (My idea)
10. Something that didn’t make sense. (My idea)
11. A person playing the xylophone that had lots of money. (Megan’s idea)

In December I returned to the school to present some puzzles and illusions, and to seek from pupils their memories of and thoughts about the Wonder Box project. The next day seven pupils logged on to send messages, though they were all simple greetings (‘hi how r u’, ‘it was gr8 to c u!’). In January, however, the forum began show signs of being a place for wondering. Pupils began to post questions:

‘I have found something wonderous today why do trees grow and how...’ (Joe, 7 January)

‘Why do we have chicken pox?’ (William, 10 February)

Further questions generated by the pupils about why dogs’ claws grow and why birds sing generated a number of ideas. One pupil located an optical illusion online and posted a link.

Over the next school year, when pupils who had been part of the original project had left, four pupils were still using the forum. They commented on and discussed events at a science park they had visited:

‘I was wondering how that thing at Snibston worked...’ (Angela, 4 November)
‘Hi Angela, I think I know what was happening with that tornado thing it was something to do with the air currents rising and it swirls round and round, can you remember when you put your foot in it and it vanished woooo! and it was telling you guys how long it takes to form, well, thats what I think anyway Angela Smith were you not listening?’
(Naira, 30 November)

The last post was made on the 20 February 2011 when Naira asked if anybody had tried an online optical illusion.

5.13.1 Reflecting on the Forum

The forum clearly had a lot of potential as a space for sharing ideas about wonder. In the first and brief stage when the original cohort had access to it, it was a place to leave evaluations of the project, and to make vows to continue wondering. Clearly, however, the posts were made to me, and were not a class discussion. For the second stage of use, the challenge I set (what did I see on the street that made me wonder and laugh?) created a focus, but pupils wished for more input from me, and gave up easily. I was interested to note that one guess came from a pupil’s parent, suggesting that, as with Red Boxing, there was potential to encourage pupils to seek wonder outside school and to enlist family and friends.

By the third stage, however, when all original participants had left, four pupils were still using the space to talk to one another and to address things they wondered about. The fact of its continuation can be considered an indication that a virtual space dedicated to wonder can sustain itself. I think that promotion of use by a teacher would have resulted in greater participation. I also think that a moderator would have added momentum via asking questions or setting challenges. It is interesting that in the dialogue about the science centre one pupil took on the role of explicator (and admonisher). Although throughout the study some pupils were happy to live with mystery, here an authoritative voice could have suggested an answer and added to pupils’ knowledge of physics – without necessarily removing the potential wonder or wondering.

5.14 Pupil Feedback Regarding the Wonder Box Experience

I returned to the school on Friday 11 December to visit and collect feedback from Oak class. Nine of the original participants were still part of the mixed year group class, twelve of the original participants having left for secondary school. I had designed a simple questionnaire to administer before delivering a talk on puzzles and illusions. The
What were the highlights of the Wonder Project?

- The showrooms, the trip and passports [Linda]
- Going to Wollaton Hall. Doing the presentation/show. [Laura]
- I loved getting told the ghost story and going behind the scene access. [Lauren]
- We very we tuck all a bant the wonder [When we talked all about the wonder] [Kelly]
- [The Pea Stall] [Lily]
- My highlights were: The trip to Wollaton hall and the first ever lesson! [Albert]
- Fossils, minerals and the activities that we set up. [Rory]
- The first day /Wollaton Hall. [Lucy]
- Hunting for stuff that makes you wonder. [Wallace]
I asked this question to find out if pupils had particularly favoured any of the activities. Bearing in mind that pupils were at no time told that the activities had been designed and packaged by me as ‘boxes’, the spread of memories to include all of the modules was gratifying. Clearly the trip to Wollaton Hall, the ‘show’ events of the Green and White Boxes, and the Black Box launch were popular. However, all Boxes receive a mention: Red (‘passports’); Orange and Yellow (‘Hunting’).

What are your memories of the Wonder Project?

- The Bebing of the lensuy in Jan 2009 {the beginning of the lesson} [Kelly]
- Opening the boxes to find out what colour and shape. Line in the middle of the classroom. Going in groups to find wonderous things. Having passports and red boxes. [Laura]
- Line in the centre of the classroom, seeing things that people bought in, passports, general wondering, freaky eye. [Linda]
- I remember going on the trip to Wolaton Hall, looking in tin boxes and generally wondering. [Lauren]
- We went to Wollton. [Lily]
- I remember not lessons but mysteries! [Albert]
- Every time I look at my crystals. /My brain (remembering). [Rory]
- The spiral thing [Lucy]
- When we were hunting [Wallace]

Again, the pupils’ memories encompass all of the Boxes.

What did you learn? Can you think of examples?

- How to wonder, what wonder means. [Linda]
- I like wonder [Lily]
- How to be a good leader. To look out for things. That wonder can mean lots of different things. [Laura]
- I learnt that wonder is about getting up and investigating [Lauren]
- All of wonder is a wonder fing. [Kelly]
- I learnt lots of things that were more important than school, like strange words and the properties of a mystery. [Albert]
- How to wonder and set up displays [Rory]
- Details on the Bermuda triangle [Lucy]
Pupils’ responses are diverse and positive. With one exception (‘Details on the Bermuda Triangle’, and possibly ‘Hunting’), responses encompass the activities of all the pursuits.

What does wonder mean to you now?

- Wonder means to me now curiosity, investigation. [Lauren]
- Wonder means everything—without wonder the human would not exist. [Albert]
- Rainbows, snowglobes, butterfly patterns, heaven, Matthew, tinsel, snow, rubix cubes, music, art, trampolines [Linda]
- It is sow cool and wicind. [Kelly]
- It make me wonder about things i dont now. [Lily]
- Wonder means that something is surprising and makes you think. [Rory]
- It’s fun [Wallace]

These responses are diverse. They are a positive prism of the Wonder Box experience. However, I see how one generally only gets what one asks for. The positivity could have been predicted from the nature of the questionnaires and the circumstances under which they were administered. What would have happened had I sought ‘least favourite memories’ or invited criticisms? Again, looking back I see not a little of the magic practitioner’s ‘influence’ (McNiff and Whitehead, 2006) at work here: my research practice was difficult to uncouple from my performance practice and thus at times I looked for highs and lows, and exercised thoughts for progression, but missed potentially useful information and insights from the middle. The fact that I am named in two responses flags up a concern that was with me (and my supervisors) from the beginning: is it possible to create an intervention that does not rely on the presence of an outside agent or thaumaturge? Would it be possible for a teacher to run a wonder intervention as part of the school year, without the need of a special visitor? This question led to the next stage of the work: the design of Wonder Box materials that could be communicated to and operated by a teacher without the need for me to be present.

5.15 Reflecting on the Wonder Box System

This necessarily lengthy account of a wide-ranging intervention has considered each of the designed Wonder Boxes and its pursuits. Each of the Boxes was shaped by up to three objectives, informed by teachers’ professed needs and a pedagogy that emerged from the
practice of the conjuror or thaumaturge, aligned to the three goals for a wonder and learning intervention which emerged during the exploratory research cycles. As part of the observation and reflection sections for each of the Boxes I have considered to what extent the objectives were met, with thoughts on possible improvements and variations.

I return now to the three main goals of the Wonder Boxes as shaped by the exploratory research. These goals were established in the belief that they would both honour the phenomenon of wonder, and allow for a wonder learning experience of maximum benefit to all participants. In my initial drafting of the design they were voiced thus:

1. An invention for wonder and learning should be **wondrous**. In other words, it should itself be characterised by the experience of wonder: participants should be assisted to feel wonder (e.g. experience ‘wows’) and to wonder about entities (e.g. questioning)

2. An invention for wonder and learning should be **constructive**. It should allow participants to express and share their ideas of wonder with others, via the construction of artefacts and experiences.

3. An invention for wonder and learning should be **propagative**. It should be allowed to grow beyond initial frameworks via encouraging participants’ initiatives.

The goals were rephrased as three declarations:

**Goal 1:** The Wonder Boxes enable an experience of wonder and wondering.

**Goal 2:** The Wonder Boxes enable a constructive exploration of wonder and wondering.

**Goal 3:** The Wonder Boxes enable the propagation of wonder and wondering.

To what extent did the Wonder Box system meet these goals?

**Goal 1:** The Wonder Boxes enable an experience of wonder and wondering.

I had anticipated and designed for, but not fully appreciated the consequences of, the generation of wonder and wondering as the Boxes were ‘unpacked’. I had found during the exploratory research that asking people to consider and describe their wonders often resulted in acts of co-wondering: wondering about wonder appeared regularly to lead to wondering and wonder. I wanted this to remain the case for the Wonder Box system, which was built around direct enquiry into wonder. The system was augmented by the evocation and enactment of the heritage, ranging from the adaptation of the magic show
to launch the quest, to the production of a distributed Cabinet of Curiosities as arena for wonder and wondering.

What I had not anticipated was how, for me as a researcher, the perceptible wonderment came close to being overwhelming. This was a result of the Boxes being so ‘busy’ with incident and pupils’ responses, with, I came to realise, a methodology and design that was not entirely sufficient. For the early sessions, I was glad of videotape to allow me to revisit the pursuits and consider the pupils’ responses. As the Boxes progressed and as, from Green Box onwards, the number of participants expanded, it was harder to ‘capture’ the moments other than through making notes during and after the sessions, or seeking the testimonial of participants. I could not be present during the Orange Box, for example, and was unable to assess whether pupils were experiencing moments of wonder and wondering. During Blue Box I was not free to circulate between the groups. I sought to be alert to expressions of wonder and wondering, and, for each of the Boxes, experienced gratifying signs that the first goal was being met (‘wows’ during Black Box, the palpable anticipation during Red Box and Green Box, the many questions pupils posed during White Box). This does not mean that the experience was unanimously ‘wonderful’ – indeed, could all participants really be expected to find wonder? – but signs that this goal was possible, and could be realised and expressed in many ways, I took as an encouraging sign that the design of a wonder intervention was not an impossibility. I was not looking for a ‘100% hit-rate’, just indications that my goal was realistic and the design adequate. I understood that further iterations could assist in developing the wonderment. However, changes in design or methodology would have assisted in planning for the future. I might have considered using more videotape, or inviting other researchers to observe and document. Furthermore, asking the teachers to work with the pupils in the provision of more detailed accounts and feedback would have proved illuminating.

Goal 2: The Wonder Boxes enable a constructive exploration of wonder and wondering.

All the Boxes gave pupils reason for the production of work, whether addressing initial conceptions (Black Box) or creating wonder events for others (Green, Blue, and White Boxes). Some of this work struck me after the event as possibly excessive (the rounds of questioning in Black Box) or potentially disconnected from the wondrous (was all the field work engaged with as a quest? or, in absence of detailed guidelines, did it ‘sprawl’?) There were, however, moments when the work gave the pupils’ an opportunity to express
themselves and create surprising and interesting instances of the wondrous: the clay models of Green Box or the stalls of White Box, for example.

There were partial successes and missed opportunities. The ‘Wonder Table’, as described in Red Box, never achieved the heights I had anticipated. My removal of pupils’ work, particularly after Black Box, meant that possible inspirations and reference points ‘disappeared’. Some of the work might have benefitted with more time devoted to construction (White Box was achieved within a week) or conversation (the Yellow Box table displays were only shared for a few minutes each).

It occurred to me that the constructive dimension could in every case be augmented in future by classroom practice. As mentioned during all of the boxes, a key factor in the success of the Boxes was the initiative and knowledge (e.g. pedagogical and practical) of the teachers involved. It was evident that Mr. Oak’s experience as a teacher meant that he was able to guide the pupils in the search during Orange Box, communicate to the class the motivation and guidelines for the Green Box ‘Wonder Smash’, and assist in the production of materials and experiences. In between the sessions that I ran, Mr Oak’s work with the pupils’ red boxes, for example, meant that the potential value of these collected exhibits could be exploited.

There is a final issue of constructive guidance. The exploratory research established that ‘wonder’ is conceived of in many ways, and that these conceptions have positive implications for learning. An experience of wonder, characterised by interest, positive affect, and motivation, might begin with a sense of anticipation, leading to an encounter, exploration and, ideally, discovery. ‘Ideally’ here indicates an important consideration – the path of wondering from inception to revelation, and the potential disjunction between early and later stages. It is here that I came to see the critical issue for wonder in formal education – the issue of the teacher, thaumaturge, or pupil as guide to discovery or protector against misinformation. Not all wonderings lead to answers, and not-knowing may itself be tonic. Mr Oak was pleased when we reached questions we could not answer (was the blue pigment on the leaf a fungus?) or situations that needed further investigation (what were the dragonfly-like insects in the garden?). However, there were clear moments when I saw the desirability of pointing out misconceptions (the sound in the shell was not caused by the memory of the sea; the ‘green thing in the lake’ was not a monster). Here again the constructive role of the teacher is fundamental.

Goal 3: The Wonder Boxes enable the propagation of wonder and wondering.
Within my conception of propagation was the wish that pupils would take up the pursuit of wondering readily. I also looked for signs that the pursuits would grow beyond the structures I drew up for them.

It is not easy to establish how much propagation occurred, although there were plenty of positive indications. Mr Oak told me of pupils continuing to bring ‘wonders’ into the classroom; pupils told me they had established wonder displays in their bedrooms. In the latter case, however, it is not possible to tell whether this was an instance of pupils wishing to please. Methods such as the provision of questionnaires could have assisted in determining how many pupils claimed to have taken up wonder practices but, again, these would not be immune from epistemic feedback. The worksheets I took back to Oak asked a number of questions but, as considered above, were not framed to allow for much other than affirmative responses. The forum, however, showed signs that pupils themselves can maintain the wondering habit. Although only eight pupils remained at the school and were able to contribute the following year, they were joined by pupils whose experience of the Wonder Boxes had been limited. There are signs that there was potential in the forum for the propagation of a culture of wonderment. Again, the influence of a moderator would have had an effect on how this flourished.

Perhaps, however, the real value in this intervention could not be determined in the time available for this study. My ultimate wish was that the pursuits were a ‘touchstone’ for the pupils, memories that they could return to later in their lives when in need of a little wonder. And although hope is not always the safest means to success, myth avows its presence in boxes.

Reflecting on the many occurrences of the Wonder Box system, I saw that the goals established for it were not unrealistic, even if the methodology meant that it was hard to gain a thorough appreciation of their realisation. My chief concerns about construction and propagation, however, I felt could be compensated for by pedagogical experience. Throughout the running of this first iteration I had put myself in the place of a teacher, but had looked to teachers for guidance. For the next iteration, I would look to simplify the design and hand over the Wonder Boxes for teachers to explore and adapt.
Chapter Six: Developing the Wonder Boxes for the Use of Teachers

6.1 Introduction

After the Wonder Box study, it was a natural progression to see if the system could be ‘parcelled up’ to allow other teachers to run something similar, without the need for the presence of an outside agency. This chapter describes the circumstances that led to the planning and production of two iterations of the Wonder Box system: a personalised written briefing (the ‘Quick Start Guide’ and the ‘Fool’s Guide’ to the Wonder Boxes), and an illustrated booklet, ‘The Wonder Box System’.

6.2 Initial Planning

My chief concern in reviewing the primary study, and a concern of my supervisors, was the need for a ‘Matthew’ in the running of the intervention. As the previous chapter makes clear, I had been mindful of this fact in the design of the Wonder Boxes, putting together the package with an eye on ease of delivery by any willing practitioner, for example, ensuring that the props were easy to acquire, and that the intervention would work in the ‘spaces in between’ of the school timetable. However, there had still been the necessity that I ‘performed’ the first iteration. One of the consequences had been that two of the pupils questioned after the event had associated me with ‘wonder’. For the next iteration I wanted to avoid this: here there was the opportunity to make myself invisible and to hand over a package to a teacher. I saw this as an opportunity to allow a community of wonderers to work to transform their realm, without the need for the physical presence of an outside agency to conduct the process.

I considered goals for the next iteration. The Wonder Box system as developed for the primary study had been shaped by a set of learner goals which I had matched to objectives for the individual boxes. These goals had proven realistic and appeared to be a good match for the realization of wonder and learning:

Goal 1 (Learner): To enable an experience of wonder and wondering.

Goal 2 (Learner): To enable a constructive exploration of wonder and wondering.

Goal 3 (Learner): To enable the propagation of wonder and wondering.

A fourth goal was now apparent:

Goal 4 (Teacher): To enable a teacher to deliver a wonder and learning experience.
I anticipated that this goal for the teacher could be met via the production of guidelines which shared ideas from the primary study and the heritage. The guidelines could be sent to teachers for them to develop for their own use. I would ask for feedback from the teachers in order to evaluate whether the learner goals were met in their situation, how they found the experience of becoming the ‘thaumaturge’, and whether these guidelines were helpful. I felt strongly that I would not risk producing ‘reductive’ step-by-step instructions, but instead sought to produce an encouraging structure that met needs of individual teachers and their schools.


6.3.1 Description

Two documents were produced to assist a teacher in Canada to run a version of the Wonder Boxes with his secondary school science class.

6.3.2 Planning

In the months that followed the work at Rabbit Island I was given a number of opportunities to present talks about the Wonder Boxes and the reconnaissance research. I found that the propagative goal for the Wonder Box system had affected my own practice as I had the opportunity to work critically with my materials, and to efficiently and usefully share wonder. At events, teachers told me that they were keen to try out some of the pursuits I described. I did not ask these teachers to keep in touch and, in retrospect, missed an opportunity to develop the Wonder Boxes.

In the winter I was contacted via email by John, a secondary school teacher from Water Falls in Canada, with whom I had had the opportunity to discuss the subject of wonder at a conference:

‘I am wondering if I can entice you into a little project... I am teaching a class called Science 12... This year I am going to add some wonder questions... Here is where you come in... Are you interested/able to do something about WONDER itself? How to ignite wonder? Some of my students already have it. They love learning for the sake of learning. Others are interested only in learning because ‘it is on the test’. I would love to see a Skype talk or podcast (like a TED talk) between you and my class. I do not want you to
put much effort into it because you are busy doing your own thing I am sure. So I wonder if there is something that you are already doing, or want to do but have not had the impetus to try. Can we piggy back?

‘Also, are there some games that you would like us to play? Is there some way that we can be involved in your research so that we are not a burden to you, but rather an advantage?’ (email, 25 January 2010).

John’s last paragraph made me think. How could a class in Canada be advantageous to the research?

Initially I had pondered John’s request for a presentation, but concluded that this would still put me at the centre of the wonder experience. I talked about this with my supervisors. Sharples wrote to me:

‘I can see why you are enticed by the offer. The opportunity to wrap up the boxes and deliver them down the line to Canada is certainly appealing. It could provide evidence that your wonder boxes can travel across cultures. But my reading of the emails is that there is a significant conceptual bridge to be crossed. It would appear that John is hoping for an inspirational Skype chat about igniting wonder that he can show in class. You are offering a packaged course of wonder materials delivered (or at least supported) at a distance.’ (email, 29 January 2010).

I felt that a telephone conversation with John would resolve any uncertainties and find a clever way forward. On 17 February we talked of possibilities. John was sympathetic to my wish to be less visible. I told him of the work at Rabbit Island. We were intrigued as to whether or not a similar approach would work in the environment of a secondary school, and specifically in the context of a science lesson. How would 16-18 year old pupils respond to the pursuits? Our only restriction was time and timing: the following week was devoted to examinations. There was then a week before Spring break, when many of the group would be leaving for Greece. Thus if we were to run the Wonder Boxes, they would have to begin in a week.

How would the methods be communicated? John requested that I produce a document containing a reflective account of the Rabbit Island study, with instructions for the Black and Red Boxes. This would need to be delivered within the week. Instructions for the other boxes could be sent the following month. John asked me to consider the idea of a ‘Start-Up Guide’, a rough ‘lesson plan’ with commentary to launch the ‘Black Box’, and
to follow this up with a ‘Fool’s Guide’ to the other boxes. I relished the challenge, but added the proviso that John considered the guides as an inspiration, not a rigid template. I explained how I wanted to continue to develop a system that allowed for the innovations of participants, including himself. John told me that this would be a gift, and told me that he would prepare a report based on the outcomes.

I set about preparing the ‘Fool’s Guide’ and the ‘Quick Start Guide’ to the Wonder Boxes. Knowing that the system had to be transmitted to a practitioner via the written word greatly assisted my thinking about the positives and negatives of the Wonder Boxes. I considered my evaluation of the Boxes. There was no doubt that the pursuits had helped pupils to seek and share their ideas about wonder, and that the result was a multiple and varied exploration. I wondered, however, if the pursuits could be streamlined, particularly in Black Box where during the ‘Divining’ phase the pupils had been requested to make multiple guesses about the boxes and their contents. Although this had yielded information of potential use to designers and researchers into wonder (e.g. what objects would primary school pupils wish to find in a box?), it struck me that the key pursuit was the pupils’ addressing of the question ‘What does wonder mean to you?’ This had been the moment that participants’ had engaged with their conceptions and ideas, and one which had remained at the heart of all the other boxes, be they collecting wonders in Red Box or constructing wonders in Green Box. I thus thought that a reduction of Black Box should retain this question at its centre.

This also led me to question the use of props. The Divining phase for Black Box had necessitated the sourcing of six different boxes, two of which I had constructed myself. Although the titular Black Box, dispenser of instructions, materials, and collector of ballots, had been designed and made with an eye on other practitioners being able to do the same, I questioned whether a busy teacher would have the time or desire to do so. I thus redesigned the Black Box activity to require a single box which could be sourced or constructed by the teacher according to their own vision.

Looking back at the phases of Black Box that had borne most fruit, I also realised the importance of pupils sharing their conceptions of wonder during the session. At Rabbit Island, pupils had found much to talk about when asked to share their ideas, first as a table, then as a class. I recalled, for example, how Linda had been interested in the difference between girls’ and boys’ ideas, and how this had led to a small discussion between Linda and Rory. The facilitating of discussion was a way for participants to
question their conceptions, and to potentially come to appreciate difference and variety. I thus felt it was important that the redesigned Black Box event offered opportunities for sharing ideas.

To meet this need, in advance of writing the Quick Start Guide, I worked with two colleagues to design a game in keeping with Black Box, which would facilitate participants comparing their ideas about wonder. Developing the Rainbow Cards, we came up with the idea of ‘Wonder Cells’, where participants each write or draw up to three ideas about wonder on three separate squares of paper, and sort this information as they seek connections between their ideas.

It also occurred to me that Black Box, as well as asking participants to engage with their conceptions of wonder, should be the impetus to continued seeking, as with the passports and constructed ‘gift’ boxes of Red Box. Thus I needed to preserve the launching of the quest in the first event. At Rabbit Island I had added a slide show and presentation as a coda, announcing the next phase. For Water Falls, I needed to consider how the quest could be launched within the Black Box activities. My solution was to ‘nest’ the boxes, with the Black Box containing a Red Box and a letter announcing the search. The opening of the Black Box would thus be a way of announcing the extended quest; the letter would instruct the participants to create their own exhibits, and provide hints for progress, including the idea of keeping a journal (along the lines of the Wonder Passports), and interviewing family and friends. The nested Red Box would not therefore be opened until the participants had carried out their quest and had prepared red boxes of their own to open.

Finally, it struck me that one of the shortcomings of the primary study was the fact that I had taken away the work that pupils had made, specifically the Rainbow Cards and Mystery Charts. I had wished that I had been able to assist in the creation of a Wonder Wall behind the Wonder Table, for pupils to access as a potential source of inspiration and ideas. Thus I saw the next iteration as an opportunity to redress this, with an emphasis in the guidelines of making pupils’ initial ideas visible throughout the quest.

**6.3.3 Acting**

I set about designing the new Black Box experience with these developments in mind. In the new version, I visualised that participants enter a room and see the Black Box in front of them. The teacher/thaumaturge reads out a letter which introduces the pursuit. (Figure
The letter, purportedly from ‘The Wonder Collective’ in the United Kingdom was intended to assist by creating another voice and an outside agency, just as I had attempted to give the original Black Box a voice.

Figure 28. Black Box Letter

To accompany the letter and to assist in the running of the Black Box module, I produced a sequence of ‘game cards’ which were to be read out at designated times in order to initiate the Wonder Cell game, the assembly of the Wonder Wall, and the opening of the Black Box.
The Quick Start Guide is a document of nine pages. It gives an overview of the Wonder Box system, listing required materials, and details the set-up of the apparatus and the running of the event. It also includes the Black Box/Red Box letters and the game cards. It is very much a reflective document, epistolary in form. Although it provides a set of instructions, it begins with the proviso that John adapts the materials as he sees fit. A copy of this document can be found in the Appendix.

An exchange of emails between myself and John ensured that the way was prepared for wondering. There was a need for me to deliver materials quickly in order for the Black Box event to take place before pupils left for their vacation. Thus I was able to instruct John about the sourcing or construction of the Black and Red Box in advance of my delivery of the Quick Start Guide:

‘I am producing simple ‘instruction cards’ which can be read out to catalyse and structure the game. The instructions will be accompanied by the promised lesson plan, plus inspirations/pictures/data from other black box work.... It occurs to me that you might like some fun weekend wonder homework. By assembling the following ‘device’ you will have a key to the generation of wonder and wondering next Wednesday or Thursday:

‘1/ Seek and find an EXHIBIT OF WONDER. This should be an object or artefact, no larger than a watermelon, that can be put in a box for up to a month. The sort of item that might make you wonder or feel wonder, and connects to something worth knowing or considering. In the past I’ve presented such things as: a whale’s tooth; lichen; colloidal gold; a stereoscope; a seed... This item will be examined and discussed at the Red Box session. Until then it will be under wraps...

‘2/ Make a RED BOX to contain your exhibit of wonder. Ensure the item is completely concealed. You can make your box in any way you like. In the past, pupils designed boxes from nets; reused boxes; wrapped items in red paper...

‘3/ Find the BLACK BOX. This should be able to hold and conceal your Red Box. This will be the object of scrutiny at the Black Box lesson: The pupils will be told that the box holds an item connected to ‘wonder’ and will be asked to guess what it might be. Obviously, the box itself might shape the thinking/wondering. I have used a selection of boxes, and have had particular success with ‘neutral’ but authoritative/interesting containers, large enough to hold the aforementioned ‘watermelon’. If the box is too elaborate it might constrain the thinking (e.g. I once had a box with an iris on it, and the
pupils thought there was a camera inside. Ditto, treasure chests tend to make participants think of ‘treasures’. The box should be secure, though it won’t need to be examined by the pupils. They should only be free to look and wonder. You should be able to open the box to remove (1) an envelope containing instructions [to be provided by me!] and then (2) your Red Box. I hope this proves a pleasant quest...’ (email, 18 February 2010)

After the weekend, I sent the ‘Quick Start Guide’. John wrote back:

‘I have been working hard on my homework... Your timing is perfect. My guys are writing tests today, so tomorrow we... wonder... I am very excited about this.’ (email, 23 February 2010)

Although we agreed that time was limited, and there was a possibility that the school year would not allow for the other boxes to be run, I wanted to fulfil my initial promise and send to John my ‘Fool’s Guide’ covering all the work I had carried out at Rabbit Island, with a section on a new box, the ‘Glass Box’, inspired by Mr Oak’s idea of a Web forum. I sent the guide to the Red, Orange, and Yellow boxes on 19 March, and the guide to Green, Blue, Indigo, White, and Glass on 9 April. These can be found in the Appendix.

6.3.4 Observing

As one of the goals for the guides was to allow a teacher to run the Wonder Boxes in my absence, I was not able to observe the teacher or class in action. Instead I asked that John send me a reflective report on the material and events. I suggested that John prepare this report in any way he wished.

6.3.4.1 The First Report

On 25 February, John wrote to me to report on the Black Box event. It occurred to me, as I waited for the news, that my InBox had itself become a Black Box, holding an infinitude of possible reports.

‘Hi Matthew... Wonder no more... well, about the happening. It happened... Here is the short and sweet. Yesterday, while they were working, I deliberately brought out the red and black box and set them side by side. I made it very obvious. They immediately asked to shake, rattle, roll them... What is in the box? It was difficult to have them concentrate on their work. I ignored their comments completely.
'Today... I kicked the students out of the room and made them wait outside. This was weird for them. I played the Harry Potter theme song throughout the room. I came outside and in a quiet, undertaker voice, invited them into the class to find their place marked with a sticky note... in COMPLETE SILENCE. I determined the groups. The spooky music was playing, video camera playing.

'I gave the students tasks. For instance, ‘the opener of the Black Box Letter’ and the ‘Reader of the Black Box letter’ etc... But of course we had to dub them with the title. So each student got down on one knee, bowed their heads and was knighted.

'They inspected the black box and did the ballots. I did the wonder cells outside the black box. They prepared their table array, did short presentations and created a wonderwall. They were introduced to the Red Box and given their assignment.

'The students said that the waiting outside with locked doors and the music intro really added to things.

'Thanks so much for the short notice work. It was very good.’ (email, 25 February 2010)

We agreed that there was insufficient time for the later boxes to be scheduled, but John thought these would be a useful resource for the future. I was happy that the Quick Start Guide had proved useful, and thought the potentially slow opening of later boxes befitted the goal of propagative wonder.

In June I received a parcel from Canada containing 16 Black Box ballots and 46 Wonder Cells. The ballots – pupils’ guesses about the contents of the Black Box—have something in common. All pupils thought that the box contained something small:

- ‘A pebble from another country made out of material found only there.’
- ‘Something small and plastic.’
- ‘Key chain or a key.’

Several of the responses give a clue as to why pupils made similar guesses:

- ‘Something small that can slide, medium weight, maybe some type of cube?’
- ‘It sounds like small beads rolling across, but it has to be tilted significantly before they can roll.’
• ‘Something small, very light. It made a clicking noise when shookey so it is either plastic or some hard material, or part of it is hard material. I have really no idea, maybe it is a shoelace.’

Evidently one or more of the pupils had handled the Black Box, and the noise it had made had provided a clue. Although this restricted the range of responses, several pupils were prompted to extended musing:

• ‘I think that what inside the box is something insignificant. I believe that it is a rock of some sort or something like a piece of glass. The reason you said it was breakable was only to spark our interest more.’

• ‘I think there is something very small but useful in the Black Box. It could be a seed. Small, doesn’t make any noise, but has the possibility to turn into marvelous and helpful plants or flowers or food. You never know what it looks like until you plant it.’

• ‘I don’t think there is very much in the black box, I think it will be filled with questions. Probably written and glued to the walls on the inside. As for the noise that is made when you shake the box, I think it’s a grain of rice. Whatever question the rice lands on, that’s the question we must address.’

The Wonder Cells, in contrast to the ballots, display a range of wonders:

• The Bermuda Triangle
• Life after Death
• Where did the Universe come from?
• Inside the heads of animals
• If there is really magic
• Space
• Quantum mechanics
• Time
• Sleep
• The Mind
• Faith
• Apocalypse
• The jungles of Madagascar
• Clones

• When you walk down the street and catch someone’s eye and wonder what they are thinking. There must be 6 billion stories out there waiting to be told.
• Things that make me wonder are things that amuse me, spark my interest or make me think.
• I wonder what our unit on wonder will be like.

6.3.4.2 The Second Report

A year after the first Water Falls Black Box event, John emailed me:

‘Just wanted to let you know I am planning to do black box in the next couple of days. Hoping to get further this year in the rainbow.’ (7 February 2011)

Two days later he returned:

‘Today black box returned to my classroom. My student teacher created a nice little box that has been hanging around and students were buzzing because of rumours from last year’s cohort.’

He reported that the pupils’ ideas about wonder had again been far-ranging, and was proving a resource for exploration.

6.3.4.3 The Third Report

Another year passed, and on 8 February 2012 John wrote to say:
‘Just wanted you to know that I'm doing black box tomorrow. Last year's class said that it set the mood for the entire semester. It helped change students from learning for grades to learning for curiosity.’

Two days later I received an email from John. It was an unsolicited communication, reporting not just on recent activity, but on the iteration of the Wonder Boxes over three years. It is reproduced here in its entirety:

‘Just thought I would give a few words about what happened during the black box presentation that I did on Wednesday. However, I think a more general discussion may be in order. I have no numbers, but I do have comments and themes. Let me recount my experience from the start with "Wonder Boxes".

‘The first time I did black and red box, it was odd enough, weird enough and fun enough to try. I was not sure how useful it was. I had no idea what answers would come out because there was no prior experience. The boxes appeared as a stand-alone island of distraction from "real learning".

‘The next year, I decided to do it again. Doing something once is not enough to determine value. This time I could guess what the students would say. So I planned a whole month long unit to address some of their wonderings. I was able to include some of their wondering in other units as well. It appeared to the students as though I customized a good portion of their course on the spot to match their "unique" wonder cells. The students wondered and I provided a place and a structure for them to investigate some of the big ones.

‘At the end of the second year, I still debated the usefulness of the boxes. Is it just something fun to do on an odd Friday when I was tired or when the students needed a break? My answer came from the students a little while later.

‘Every year I have my students finish the year by giving me a "big brother confession" video. I tell them that they are allowed to tell me what they think of class and of me, but there is no obligation. Every student does participate. You often hear of specific labs or specific activities. However, a few of my more insightful students made some interesting comments. They mentioned only the black and red box by name. They said it was the start of their curiosity. It marked the beginning of a change in attitude. The whole class generally changed from "learning-to-get-grades-for-class-ranking-and-scholarships" to "learning-because-we-want-to-know".
‘The whole class had a 6 week assignment to do. They did great work. But at the end, they decided to not have it count towards their final grade. This is a landmark because these students are competing against each other for scholarships and assigning marks would help in their race for funding. They thought assigning grades would contaminate the work and the learning. These insightful students believed that Wonder Boxes was the seed of this event. I agree.

‘So this year, I decided to do it again. On Tuesday, I warned the students that the next day, they should carefully come into the classroom. It will be dark and that is the way I wanted it.

‘On Wednesday, I had Harry Potter-like music playing in the background on loop. The lights were out. The Smartboards were on to provide some light and had "wonder" as a title. There was a black and red box sitting in the center of the room. I stood quietly and still until class began. To start class, I simply gently shook a rain stick back and forth in a spooky fashion. Everyone quieted. I asked for a volunteer in a quiet serious voice. He knelt and was knighted - the "lector of the black box parchment". He read. They filled in their black box ballots. He read the wonder cell letter. They completed their wonder cells individually, in the dimmed light, in quiet with only music playing. I turned the lights back on. They shared at their tables of 4 students. Each table organized their table display. Visits from table to table happened. As a class they started to create their wonder cell wall. I cut them off a few minutes short to read the red box invitation. The wonder wall is incomplete.

‘After class as everyone is on their way, one particular student came up to me. I have taught this student 5 courses and he has only talked to me twice in a year and a half. He is a very thoughtful but quiet boy. He said, "That was good....very good". His body language said that although he had a large vocabulary at his ready, he could only think of...good.

‘He is a thoughtful and wondering person. If I read between the lines, I believe he was interested in the wonderings of other people. I think he appreciated to pause and quietly wonder on his own. But I think the impact for him was to share and discover that many students from all sorts of backgrounds wonder about the same things that humans have been eternally wondering.

‘The sharing and display portion of this activity is very important. As I walked around, every table exclaimed when someone shared. One person would share that they wonder
what is out there in the great beyond followed by an exclamation that someone else also wondered about the same thing. It was a bonding moment for the members of the group. They shared a deep part of their soul, took risks and found commonality. One introverted student was reluctant to share, it was too personal. Then a more extroverted person would share. The introvert jumped in and said, "that's what I had too”.

'On Thursday, I asked a couple of students, who showed up early for class, about their thoughts on the black box class. They were uncertain. It was weird. A bit hokey and cheezy, a bit intriguing. They were not sure what was coming next. It seemed out of place, but openly wondered how it fit in with the rest of the semester.

'Tomorrow, they are planning to complete their wonderwall. In the main hallway, there is a glassed window. It is about 1 m tall and 2.5 m long. On the other side of the window are three shelves that are 30 cm deep. The back of the cabinet is a double door so students can gain access to the contents from the classroom behind. Their plan is to remove last year's red boxes. They want to tape their wonder cells to the glass so that the contents of the shelves are obscured to passers-by. It should create wonder in the passers-by. They are going to use a sharpie marker to make connections from one large category to another, sort of like nodes in a computer network.

'Over the next few weeks, they will do red box. They will be presenting their show and tell after their March break. Many of them are going on vacations with family, friends. The grad class is going to Rome. It should be interesting.

'I feel badly that we only ever get to do black and red. We run out of time. It is very time consuming to take too large of a detour from my curriculum. However, I told my previous student teacher to come in to witness the activity and I further discussed the rest of the rainbow. She will most probably be an elementary or middle school teacher. I feel like this wonder program would be a better fit there simply because you can bring in language, writing, art, math, science, trades etc... into one project. At middle school, the logistics and time with fewer restrictions would make the whole rainbow possible.

'Oh, one interesting point. The second year class wanted to leave their ballots, wondercells and red boxes as some sort of time capsule for future generations of wonderers. Last year's students wondered what this year's students might wonder about. It turns out that they are very similar.
‘Just before March break is a crazy time because the students are excited. Trying to lecture is impossible. So on the Friday before the last week, I am going to say, "I wonder if world hunger is possible to solve. I want a whole class presentation by next Friday before you go away. You have all week of classes to get it done."

‘These are my observations and thoughts. I hope it has some usefulness. It has caused me some good "wondering".’ (email, 10 February 2012).

6.3.5 Reflecting

With the next iteration of the Wonder Boxes as represented by the Quick Start Guide and Fool’s Guide, I had set out to communicate the system to another practitioner. The goals for the Wonder Boxes remained the same (participants experience wonder and wondering; wonders are constructed; wonder is propagated) with a new overarching goal informing the preparation of materials: to enable a teacher to run an educational wonder experience. This section considers this iteration in light of the goals.

Goal 4 (Teacher): To enable a teacher to deliver a wonder and learning experience.

John’s emails suggest that this new goal was met, although I express this with caution. It is not possible to ascertain whether the materials themselves would be effective in the hands of any teacher. On this occasion, it is clear that the flourishing is a result of John’s practice, marked, in the first instance, by his initiative, and sustained by his ingenuity and experience as a teacher. John adapted the materials for his own use, and worked with pupils’ responses to grow the wonder and learning experience.

I was interested to note John’s innovations in the first year: the showing of the boxes the day before to pique curiosity, and the preparation of rituals sequenced for when pupils enter the room. However, even more encouraging is how John adapts the Wonder Boxes for use over the space of two years, following his observation of how pupils themselves responded to the experience. What appears to be particularly helpful for John is the fact that he has been able to make use of the wonderings generated by the pupils in the first year. Having run the Black Box once, John feels that he can ‘guess what the students would say’. There is a sense that John is tapping into and developing his own qualities as a ‘wonder worker’, gleaning information via observation and making predictions, all serving a playful but serious educational aim. Through opportunities to execute expertise he is able to plan ahead for next year’s group and, very much in the spirit of wonderment, devise what has the potential to look like a prodigious feat in the eyes of the students: ‘It
appeared to the students as though I customized a good portion of their course on the spot to match their "unique" wonder cells.’

**Goal 1 (Learner): To enable an experience of wonder and wondering.**

Within John’s reports are indications that pupils (and indeed John himself) experience both curiosity and surprise as a result of the sessions, toying with what John is concerned might seem ‘hokey and cheezy’ to fifteen year old pupils. A positive affective climate is attested to, with John reporting that introverted pupils are encouraged to join in, and groups bond after finding connections in the things they wonder about.

**Goal 2 (Learner): To enable a constructive exploration of wonder and wondering.**

John attests that the ‘sharing and display portion of this activity is very important’. The presenting of ‘wonder cells’ offers an arena for interaction and connection. Furthermore, pupils have the initiative to use their work to generate wonderment in others, using the cabinets that are visible in the school hall:

‘They want to tape their wonder cells to the glass so that the contents of the shelves are obscured to passers-by. It should create wonder in the passers-by. They are going to use a sharpie marker to make connections from one large category to another, sort of like nodes in a computer network.’

**Goal 3 (Learner): To enable the propagation of wonder and wondering.**

From the report, it appears that pupils have adopted the practice of creating and prolonging wonderment innovatively. The first year cohort establishes anticipation in next year’s cohort, who are ‘buzzing because of rumours’. The second year pupils desire to generate wondering in other pupils by utilising the cabinets, and furthermore have the idea to ‘leave their ballots, wondercells and red boxes as some sort of time capsule for future generations of wonder-ers’: a sign that pupils envisage a tradition of nurturing wonder.

There is also the sense that potential blocks to wonder and wondering in turn become an aid to propagation. Time is an issue, as is the restriction imposed by the need to work within the science curriculum. Nevertheless, John sees this as an opportunity to pass on his version of the Wonder Boxes to his ‘previous student teacher’.
6.4   Cycle 11: The Wonder Box Handbook

6.4.1   Description

A large format (A4) colour handbook of 117 pages was distributed to three teachers in Cheshire to assist them in running Wonder Box pursuits. This handbook is available in the Appendix in digital format.

6.4.2   Planning

In March 2010 at a conference for teachers I delivered a presentation on the Rabbit Island Wonder Box project. I talked about my belief that wonder should be propagative, and invited participants to get in touch with me if they thought I could help them foster and grow wonder in their schools. Afterwards I was approached by ten teachers. They wanted to feed back to me that they thought that my work was important, that wonder was essential, and that any form of intervention or guide would be a ‘godsend’. I asked how a useful guide could be produced. One teacher, Edna, told me:

‘Produce a nice easy read with lots of pictures and ideas. We have to get through so much paperwork... Give us something we can read and enjoy. Not a Word file... Inspire us! No Bloody Lesson Plans.’ (Edna, 12 March)

A fortnight later I received three emails:

‘I was recently inspired by your presentation in Lancashire on 12th March. We would like to plan our lessons over the Easter break ready to start on Monday April 12th. We would like to cross the learning over as much of the curriculum as possible – so any information, experience or ideas you have used or would like to we would be most grateful.’ (email, Wendy, 22 March 2010)

‘We met at the recent conference... I am Deputy Headteacher at Honeypot School in Lancaster and would be keen to implement some of your ideas regarding the coloured boxes in a week-long project to develop awe and wonder at school. Please can you forward me any relevant information that you have.’ (email, Katy, 24 March 2010)

‘Myself and two colleagues from our school, River Run Primary, Chester were at the conference two weeks ago. We were really interested in the work you’re doing and felt inspired to have a go at some of the ideas! I teach a Y1 class of 30 and my FS2 colleague is also interested.’ (email, Amy, 24 March 2010)
From these emails I learnt that schools in Lancashire broke up for Easter holidays on 26 March, and school resumed 12 April. This was to be an important consideration if I were to deliver materials on time and, as made clear by Wendy, it would ideally be ready before 12 April, to allow teachers time to prepare. I set about producing materials immediately.

I did not want to send the Canadian ‘Quick Start Guide’ or ‘Fool’s Guide’. These had been tailored towards John’s secondary science class. Here I was required to share ideas about the Wonder Boxes that teachers could adapt to suit their needs: Wendy wanted to plan lessons that would cover the curriculum; Katy wanted to prepare a week-long wonder project; and Amy and her colleagues wanted to ‘have a go at some of the ideas’ I had presented when talking about the heritage of wonder and the design and operation of the Wonder Boxes. I had a vision of producing a document that was a compendium of my work to date, including some of the material I had prepared for Water Falls. More importantly, I wanted this to be useful for ‘any teacher, any class, and any school’: this became the by-line for the booklet I set about preparing.

6.4.3 Acting

I designed and produced the ‘Wonder Box Handbook’ using a scanner (for photographs and documents) and PowerPoint, creating an A4 booklet of 117 pages. In it I sought to provide everything I thought a teacher would need in order to run the Wonder Boxes by, for example, including lists of materials and suggestions for preparation. I also enclosed materials prepared for Water Falls. I wanted, however, to inspire teachers to go beyond this, in order that they could meet any needs they had, such as Wendy’s desire to ‘cross the learning over as much of the curriculum as possible’, and in the hope that they would find space to innovate and improve on my work. I was mindful of Edna’s stern words concerning Word documents, and felt it was important to provide photographs of all the boxes, giving examples from each of the lessons at Rabbit Island. The material was arranged in three sections: a summary of the Wonder Boxes, including accounts of each of them and visualisations of the ‘box set’; a section of practical materials such as thoughts on scheduling and suggested timetables; and a section devoted to ‘inspiring things’ – devices of wonder, such as Möbius loops and labyrinths, with instructions on how to construct them. There were pages devoted to definitions of wonder from dictionaries, literature, and children’s work; thought pieces on research into wonder; and
a page presented as a ‘cabinet’ of wondrous things, followed by an empty cabinet to be filled by the reader. Figure 29 shows four representative pages.

At the beginning of the booklet I added some simple instructions:

- **STOP:** Find a place conducive to wondering...
- **READ:** Work your way through this Handbook...
- **GO:** Plan for Wonder. Guided by the Handbook, draw up a timetable...
- **WONDER:** Let the wondering commence!

I wanted the booklet to be a pleasure to work with, and not a burden on teachers’ time. I saw it as a ‘catalogue’ to be browsed in the first instance, to assist in the generation of ideas, which could then be returned to in order to create a practical structure for wondering.

I showed the first draft to one of my supervisors (Sharples). He marked the first draft, suggesting clarifications and providing corrections. I sent an electronic version to two teachers I had met at another conference, both of whom professed to liking the book. They had no criticisms to offer and made promises to use the books themselves:

‘Yes yes yes yes... I would luuuuuv to be part of your project and send you lots of data, reports, clip, etc. (Agnes)

‘YES PLEASE! How exciting and we will give you plenty of feedback, promise!’ (Marie)

On 25 March I submitted my proposal to the University Ethics committee. I was reminded that I would need to prepare consent documents for pupils and their families. These were not incorporated into the booklet but were prepared for sending via email. I did not want to send the booklet out as a digital file: I wanted to produce a paper-based version which could be annotated by teachers, a directory that could be thumbed through for inspiration. Here I was mindful of Edna’s request (‘not a Word file’.)

Unfortunately, time was against me and my ambition to send out the booklet over the Easter Vacation was a tall order. The necessary process of ethical clearance, followed by the printing of the booklet, meant that materials were not sent out until 22 April, ten days after the beginning of term.

The lack of response from the teachers was not encouraging. I sent an apologetic email to Wendy, who had hoped to prepare lessons over Easter. I did not hear back from her. I
talked to Marie. She told me that with term underway, the best she would be able to do would be to try out some of the ideas on a rainy afternoon. She was particularly keen on having her pupils try out the Möbius strip (p.112 of the Handbook, see Figure 29). I consoled myself with thoughts of propagation, and the slow germination of some seeds.

Figure 29. Pages from the Wonder Box Handbook
The goal of enabling a teacher to construct and deliver a wonder and learning experience according to the teacher’s needs was fundamental to this final part of the study. I had been concerned, with the delay in sending out the handbook, and my growing appreciation of the demands on a teacher’s time, particularly at the end of a school year, that this iteration of the Wonder Boxes would not have the time to be realised. The pragmatic and adaptable stance that my model of Action Research had allowed me to adopt may have helped with the exploratory work and kept me sanguine throughout the research process, but in the weeks following the sending out of the handbook, I realised that I now risked failure.

I had missed one teacher’s deadline for planning. Another teacher had not got back to me. I looked back at the handbook and perceived considerable faults: too much information, and lacking a ‘quick start guide’ which in cases like this might have helped a busy teacher. A colleague at the LSRI sat me down and told me the handbook was ‘insufficiently wonderful’, that aesthetically it was too garish, and in its A4 format, looked unremarkable. I also left the handbook with a headteacher, who reported that he would have liked to have seen more ‘recipes’ for wonder lessons. He also voiced doubt that a busy teacher would have time to draw up what was effectively a ‘term’s work’ at short notice from such a disparate collection of ideas.

I was not expecting to hear back from Amy at River Run School. But wonders never cease...

6.4.4 Observing

As with Water Falls School, the goal of passing on the Wonder Boxes for another teacher to use and adapt precluded my being able to observe the response to the handbook. Again, in lieu of direct observation I present the teacher’s reports on the experience.

6.4.4.1 The First Report

On 25 June I received an email from Amy:

‘Hi Matthew,

‘We have finally begun wonderboxing and are really enjoying it at River Run!

‘We first of all wondered about wondering and enjoyed making wondering facial/body expressions. Then we started with the Black Box. Each class had the box for a session and gathered their wonderings. Reception started in small groups to do this, Year 1’s
discussed ideas with their Talking Partners, shared ideas and then recorded their wonderings... Year 2 followed a similar pattern but more independently, with only an introduction to start them off rather than a discussion.

‘Over the course of the day we had lots of discussion about why we need to wonder. I suggested to children that they might like to continue wondering about the box and other things as they were getting on with their child initiated play activities. I heard some interesting conversations as they wondered about all sorts of things.

I was surprised how easily they took on the language of wondering, having expected them to be too distracted by wanting to guess what exactly was in the box – they were more than happy to wonder. This seemed to be more developed in the Y1/Y2 children.

‘All 3 classes got together at the end of the day for the grand opening of the box. We thought about whether opening the box would answer all our wonderings or start new ones. With great anticipation the lid was removed and the contents revealed. Layers of sequinned netting hid a golden key on a long blue ribbon. This has inspired a whole new round of wondering and the children in Y1 and Y2 have recorded their wonderings about the key.

‘Next week we plan to collect ‘wonders’ from around the school grounds, working in teams made up of children from each year group to gather and display them. We will also be working with Y6 who will help the younger children make their red boxes to take home.

‘The other two teachers doing this are really enthusiastic about how engaging this has been so far for the children. Follow up work has given wide cross-curricular links – Literacy, ICT, History, Geography etc.’ (email, 25 June 2010)

6.4.4.2 The Second Report

On 10 June 2012 I heard again from Amy via email:

‘We're still wondering....it has become part of our normal language, certainly in Year 1 anyway and we continue to have a much loved ‘Wonder’ display case.’

I was intrigued to know more. Aware both of the pressures of time, I sent Amy three questions about the experience of the Wonder Boxes and the Wonder Box handbook. On 11 July I received her answers:
1. What did you, your colleagues, and your students find most enjoyable and effective about wonderboxing?

The ‘Wonderbox’ experience encouraged us to ‘open our eyes’ to see things afresh. We took pleasure in the unusual and the mundane and enjoyed sharing them together. From papery wasps nests to the unidentifiable, we enjoyed our wonderings and the children continued to return to the display area to wonder.

2. Did this influence you, your colleagues, and your students beyond the wonderbox lessons themselves?

The concept of ‘wondering’ has become very natural to us. It’s a question we ask often of the children and the open ended nature of the question seems to give them a freedom in their thinking. We have, before a school trip or other experience, asked the children if they have any ‘wonderings’ and have recorded these, returning to them afterwards to reflect on what we’ve found. Wonderings seem freer than ideas and thoughts somehow, and the children do it naturally and with much less thought towards ‘right’ answers. The children’s ability to ask questions (quite a difficult thing to develop) has noticeably improved too. The wonderbox remains a valued area of our classroom.

3. What would you do to improve wonderboxing and the wonder box guide?

It’s hard to improve on this without it becoming too prescriptive. Maybe you could consider how teachers could link the wondering technique with specific curriculum areas, but already this has the potential to narrow it.

6.4.5 Reflecting

Goal 4 (Teacher): To enable a teacher to deliver a wonder and learning experience.

It is apparent from Amy’s emails that the handbook provided a workable structure. Amy writes of the Black Box and red boxes, and indicates that collecting pursuits around the
school grounds have been scheduled. What stands out again are the innovations to the system:

- The running of a day of wonder inclusive of three year groups
- The sharing of the Black Box between classrooms
- The idea of pupils making ‘facial/body expressions’ of wonder
- The contents of the Black Box, a golden key, to continue the wondering
- The mixing of year groups for Orange Box hunting and Yellow Box displaying
- The involvement of older children to assist in the creation of Red Boxes

Amy suggests that the guide could be improved by making connections to specific parts of the curriculum, but is concerned this could prove too ‘prescriptive’ or ‘narrowing’. Amy is being kind here. Alas, there was insufficient time to seek any other insights into how the book could be improved. I return to this issue in Chapter Seven.

**Goal 1 (Learner): To enable an experience of wonder and wondering.**

In her first report Amy expresses her surprise at how readily the children take on ‘the language of wondering’ and in their actions appear to be happy to live with mystery –to Amy’s surprise.

Amy reports that the ‘concept of ‘wondering’ has become very natural to us.’

**Goal 2 (Learner): To enable a constructive exploration of wonder and wondering.**

Amy refers to a ‘much loved ‘Wonder’ display case’ and a ‘wonderbox’ that ‘remains a valued area of our classroom’ (these may be one and the same thing). In the first report it is clear that pupils work collaboratively to record, make, and collect wonders.

**Goal 3 (Learner): To enable the propagation of wonder and wondering.**

Amy’s use of a golden key as the object of wonder in the Black Box is an innovative way to inspire ‘a whole new round of wondering’. She reports that the experience ‘encouraged us to ‘open our eyes’ to see things afresh’, appreciating both ‘the unusual and the mundane’, with the suggestion that this is a good foundation for a continued culture of wonder.

The Guides as a way of communicating the experience were sufficient, if underdeveloped. It was fortunate that the teachers who took them on were enthusiastic and imaginative,
and the successes that they report are clearly a result of their own practice, given shape and ‘permission’ from the materials provided. The wide range of teachers’ needs that I hoped the Handbook would meet (e.g. helping Wendy plan lessons covering the school curriculum, helping Katy create a week-long wonder project) influenced the expansive nature of the contents. However, usefully packaging ideas should involve more than providing a bundled account of work done and suggestions. Colleagues suggested a more ‘wondrous’ looking/feeling guide. One colleague suggested a sequence of colour-coded books, each dedicated to a single box, with an accompanying chart. In addition to the solution proposed below, future materials would need to be considered for meaning, clarity, and aesthetics (Hartley 2004, Dirksen, 2012).

6.5 Conclusion

Some oversights in the design of this final phase of the study, in particular the lack of questionnaires that address the goals set for the materials, has resulted in a cautious interpretation of feedback. Nevertheless, from the reports of John and Amy, there is clear indication that on these occasions the goals were met and the materials provided were sufficient for them to run a wonder learning experience in their schools.

My major concern, however, is that these two teachers are not necessarily representative of all teachers. They were keen, in the first instance, to take on the challenge of working with wonder, and drew on their imaginations and understandings in the spirit of exploration. Although it is difficult to foresee any success arising from a cynical and lethargic approach to wonder, how to provide materials that will assist and inspire those who might need clearer guidelines?

Furthermore, was the idea of an analogue book misguided? Would a digital format have helped? Although I had visualized that a physical ‘catalogue’ that could be flicked through would have been an unstressful and pleasant pursuit, I have since met teachers who enjoy accessing materials on-line and using digital resources. My Baroque analogue bias may have disadvantaged my research and the wonder work of teachers and pupils. A digital Wonder Box Handbook could have offered printable work sheets for the pupils (e.g. for Black Box) and on-line questionnaires for teachers to return to me. A digital resource would also have been less expensive to produce, and could have been easily modified over time.
Concerns aside, in the hands of resourceful teachers, it appears that the guides to the Wonder Boxes (and the pursuits of the Wonder Boxes themselves) proved sufficient for the launching of wonder based learning projects for pupils at both early and later stages of formal schooling. The fact that, two years on, the two teachers who took on the Wonder Boxes are still using them, in clearly elaborated forms, is encouraging. The question of useful propagation remains, and is the focus of the next chapter.
‘One last thought: it is conceivable that we only know fully what we thoroughly enjoy; if so, delight must be sewn in... to our epistemologies, our methodologies, our designs, our plans, our ways of working as researchers and scholars. Delight generates and sustains thought.’ (Su, Nixon, and Adamson 2010, p.94)

7 Conclusions and Reflections

This thesis considers the nature of wonder and explores its potential for school-based interventions. As a practitioner, despite a markedly positive journey, I have sought to become a critical and reflective researcher, resistant to an ultimate ‘truth’ of ‘wonder learning’ but keen to map usefully the terrain and to provide sufficient exploration to constitute a contribution to understanding. In this chapter I look back at the work to consider the extent to which it answers the questions I set out with, discuss the shortcomings of the study, describe ongoing practice, and posit ways forward.

7.1 Research Overview

The aim of this study has been to come to an understanding of wonder, including individuals’ conceptions of wonder and the traditions wonder has given rise to, while seeking an effective and propagative mobilisation of wonder and wondering that can be a boon in school settings. Two simple questions influenced the research and the paths it took:

1. What is ‘wonder’?
2. How can we mobilize the heritage of wonder and the insights of the living for the design of wondrous experiences in school settings?

Five cycles of work constituted the research. Through these cycles I sought to explore widely, usefully, and considerately with a vision of the practitioner-researcher as a responsible, influencing, creative, and opportunistic agent (McNiff and Whitehead 2006). In the reconnaissance work, the design of the research was influenced by my practitioner-centred choice of literatures, particularly those that recounted an identifiable heritage of wonder, in parallel with the growing collection of ideas allowed by the explorations. As will be considered below, this inquiring, acquisitive, and productive cycle allowed for the production of a set of design tenets, increased the catalogue of materia medica, and helped discern extra phases for the structuring of educational wonder events. This ‘toolkit’ for the design of educational wonder was used in the construction of school-
based experiences which in turn yielded multiple events, productions, and insights. Small-scale attempts to package the intervention for the use of teachers highlighted the positive potentials for growing wonder projects, while suggesting the need for continued work and emphasizing the importance of teachers as exploratory workers with wonder.

7.2 What Did This Thesis Uncover About the Nature of Wonder?

The study was shaped by research projects that sought insights into educational wonder and, in particular, sought first to understand how people considered and experienced wonder. I developed a number of descriptions of wonder based upon participants’ responses to experiences they undertook (e.g. Wonder in Carbon Land), questionnaires (e.g. The Wonder Cupboard), and interviews (e.g. Street Interviews) to catalogue wonder, wonders, and wondering. These descriptions included the description of educational wonder to reify practice, an identification of possible phases for an educational wonder experience, a classification of dimensions of wondrous things, and an identification of a heritage of wonder-connected practices. This set of descriptions was intended, and proved amenable, as a basis for constructing an intervention, which would generate a vision of an educational wonder experience.

Although far from exhaustive, the descriptions proved helpful in orienting the research, establishing goals, and designing the intervention. It is not possible to say here whether other ways or characterizations would have been better, although some reflections are presented below based on the events of the studies.

Over the time of the reconnaissance work I derived a description of wonder oriented to educational experience which ran:

‘Wonder is a multi-phased and ultimately affectively positive encounter with an eliciting object, artefact, environment, or situation, that prompts questioning and exploration in search of meaning and has the potential to connect to growing knowledge and appreciation.’

This description was a chimaera of information derived from a range of accounts located in the ongoing review of the literatures and in my explorations, in particular the direct enquiry into wonder represented by the Street Interviews. It was not considered a theory to be tested – it was a description which oriented the research, and which found extension in other themes considered in this thesis: the concepts of awe and astonishment, for
example, or the cautionary themes of ‘broken wonder’ or impermanence outlined in Chapter Two.

Looking back, I see the description’s continued value as a motto, but also appreciate that much remains to be unpacked when the goal involves operationalizing a definition to design and then reflect upon a wondrous educational experience. Taking this into account, I would suggest that when specifically considering the nature of wonder when harnessed for education the following description is considered. It was this definition that I sought to manifest in the Wonder Box system.

‘An educational wonder experience grows from the anticipation of and/or encounter with an eliciting object, artefact, environment, or situation that prompts and sustains interest, questioning and exploration in search of meaning, leading to a sharing of the wonders experienced with others.’

**7.3  What Did This Thesis Uncover About The Design of Wondrous Experiences In School Settings?**

During the cycles of preparatory work, I established three goals for the design of wondrous experiences: that participants should experience wonder in both its affective and cognitive dimensions; that it should it be constructive, allowing participants to express and share their ideas of wonder; and that it should be propagative and grow by encouraging pupils’ initiatives. To achieve these goals in the Wonder Box system, I developed a series of activities I wished to encourage and ordered in them phases. Each of the activities draws strongly upon specific heritages of wonder. Additionally, the research-derived anatomy of the ‘dimensions’ of wondrous (namely novelty, mystery, surprise, status, meaning and interaction) that had been visible in the participants’ responses in cycles 1-4 was drawn upon to design both these activities and the artefacts within them. Consequently, I begin this section by reconsidering the eight phases and the extent to which the Wonder Box system implemented them in the ways that I had hoped it would. The second part considers whether the system worked as a whole by addressing the extent to which the three goals were met.

**7.3.1  The Phases of an Educational Wonder Experience**

The eight potential phases of an educational wonder experience as identified during the reconnaissance were found to be achievable and helpful in the designing of the intervention. These phases were considered to be:
1. **Anticipating**: establishing a desire to find out via intrigue;
2. **Experiencing**: delivering prepared encounters with the wondrous;
3. **Investigating**: facilitating researching into and searching after the wondrous;
4. **Discovering**: facilitating critical meaning-making, or an appreciation of mystery;
5. **Developing**: helping participants to work with their discoveries; assisting work with things found (including reflection, design, continued seeking);
6. **Manifesting**: providing opportunities to make learning visible via constructions;
7. **Celebrating**: ensuring others can experience work produced in positive environment; sharing findings joyously;
8. **Propagating**: allowing for wondering to continue beyond time and scope of intervention; encouraging growth and development beyond expectation.

These phases, devised from the heritage and expanded during the exploratory research, were key to the design of the school wonder intervention. The Wonder Box system did not seek to implement each in turn but instead treated them as sequences to be found within each boxes. Thus, for example Black Box as the first box in the series strongly emphasised anticipation but all the subsequent phases were touched upon. In the field it was possible to witness the phases made vivid in people’s accounts and in the children’s responses to the event of the Wonder Boxes.

Anticipation, a phase of wonder identified by individuals during the street interviews, proved to be important for generating interest and motivating exploratory behaviour in the boxes. Throughout the intervention, artefacts were designed to be mysterious so that children were not able to discern their contents from initial inspection of the outline (questionnaires were presented within glossy envelopes, boxes hid objects, curtains hid door to classrooms, etc). Children’s responses in the majority of cases showed how this added to the experience by piquing curiosity and transforming their expectations of the classroom and normal practice. They could also choose to prolong anticipation, for example when pupils asked for the cloth covering the table to be removed slowly. Nonetheless, the account of the Black Box show, which had a remit for engaging participants with mystery, shows how anticipation had its dark side – intrigued pupils wanting to access the site of the pursuit ahead of time made preparation difficult. Furthermore, anticipation must ultimately deliver; it must pave the way for a meaningful experience.
The phase of Experiencing struck me as a magic practitioner to be key to the wondrous experience. This idea arose from the identification in the exploratory research and the literature review of the importance of a wondrous material encounter as key to unfolding, as evinced by Pestalozzi’s Object Lesson, and the experience of the Cabinet of Curiosities (Evelyn 1955). The major design dimension that had to be embodied was that of meaning – that is, the artefacts, objects and events that the children encounter should be significant both to them and to the intended outcome. But this meaningful experience would not in itself be wondrous unless it also drew upon other aspects of the designed dimensions (such as surprise, status, or novelty). The box which illustrates Experiencing more vividly that all the others is Green Box, where pupils examined closely the contents of a small cabinet whose contents had been selected to instantiate the dimensions of wonder identified above. This phase must stimulate interest sufficient to sustain action throughout subsequent phases and it is clear for many children that scrutinising the cabinet did achieve this ambition. They returned to it, asking questions both to themselves and of me, shared ideas with one another, and then used the experience as the basis for their own constructions. In this, the key concern is to manage novelty, surprise and mystery with a careful hand. The inclusion, for example, of the bottled rat led to many pupils becoming fixated on it to the exclusion of other objects. Moreover, balancing the need for multiple interests means that it can become all too easy to create a cluttered and overwhelming display.

Investigating is at the heart of the Object Lesson, as devised by Pestalozzi, and a focus of the Red Box pursuits, which involved pupils seeking wonders beyond the school and examining them together in a dedicated session. In the weeks between the Black Box show and the Red Box lessons, pupils had sought objects and artefacts in order to create a repository in the classroom. This time it was the pupils’ views of wondrous dimensions that would shape the activity. Children collected a number of exhibits for scrutiny and classroom discussion testified to the interest that the collection generated. However, it became clear that here was a pursuit that would have benefited greatly from additional support to sustain pupils’ engagement with the task between lessons. The ‘Wonder Table’ that resulted was sparser than I had hoped, partly as a result of the lack of support and the concerns pupils had voiced about the security of their collections. Thirdly, a concern for aesthetics may have inhibited some pupils’ actions. Reflecting on these issues allowed me to address them during the Orange and Yellow and Blue Boxes, which also had strong elements of investigating.
Developing wonder, by which I mean helping participants to work with things found, is a key practice in the tradition of the Cabinet of Curiosities and was here most important in Green and Indigo Boxes. In the Green Box pursuit, pupils worked in small groups to prepare a Cabinet of Curiosities experience for pupils from other classrooms; in Indigo, the pupils that had been an audience to the Green Box became co-developers of a wonder show. Pupils worked together to understand and elaborate on the growing collection of wonders in the classroom. Of the identified dimensions of wonder, here I felt the biggest challenge was for pupils to come to an appreciation of meaning. The challenge of preparing an interactive display provided them with rich opportunities for expression, questioning, and humour, and it was apparent to observers that the children worked with focus. One additional lesson that emerged from the analysis of the unfolding of the Green Box pursuit was the importance of allotting sufficient time for pupils to try things out — a continuing issue with the strictures of the school day, as noted in the wider literature (e.g. Thomson, Hall, and Jones 2010).

Manifesting is the process of constructing and assembling purported wonders, fundamental, for example, to the practice of conjuring. All the boxes involved manifesting to some extent, and from Green Box onwards, pupils were challenged to construct wondrous items from an assortment of materials in greater quantities. In Indigo Box, pupils were asked to work together to develop and manifest wonders for a larger school audience: it swiftly became clear that this challenge was appealing to many pupils. The artefacts created demonstrated the creativity and range of interests of the pupils. I saw evidence in many cases of the multiple dimensions of wonder that had guided my own design practice and which provides some indications that pupils were either already attuned to these dimensions, or learning implicitly from the models I provided. The challenge on the day for me was its unpredictable nature, both in terms of the expected length of the sessions and in managing and facilitating pupils’ work. I was unprepared, for example, for the pupils’ appetite for manifesting — my box of paper and cardboard was quickly used because of the eagerness of the participants, and this necessitated the opening of the school art cupboard. Clearly, working in the gaps of the school timetable to facilitate wondrous experiences requires much flexibility.

Celebrating is located in many of the heritages of wonder and reaches its most festive expression in the White Box finale. This last of the planned boxes offered opportunity to bring together the whole school in a celebration of wonder; within the event I witnessed
teachers gaining insight into pupils’ interests and pupils using the opportunity to make displays that were meaningful to them. In celebrating, pupils also showed that they were mindful of the need to balance more obvious dimensions such as mystery and novelty with the less tangible dimensions of meaning and status. Both analysis of the artefacts and pupils’ spontaneous attestations support this assertion. Nevertheless, not all exhibits appeared to reflect wondrous dimensions, as in the case of the War display in Oak whose designers, despite attesting to the wonder they felt was inherent, had not clearly communicated it in their work. Observers on the day reported variations in the quality and aesthetics of the materials prepared, but not in the high levels of enthusiasm and initiative they encountered. Again, issues of practicality were key – the timetables of visits prepared by the teachers enabled all pupils to be part of the celebration. The White Box was a highlight of the Wonder Box system and one that showcased many of the experiences that the pupils had had earlier. Nonetheless it has to be acknowledged that this was the most demanding of the boxes to unpack, in both its whole school involvement and its many demands on time and staff resources.

Finally, Propagation: this, I suggest, is the hardest stage to design for as it relies on willing uptake of practice by participants. The variety of experiences that the intervention planned for and encouraged was partly aimed to attempt to encourage multiple potential ways forward. However, opportunities for propagation are most evident in Glass Box – the web forum developed by Mr Oak which he allowed me to use for the Wonder Project. It was clear from the posts that the pupils perceived its main value to be in communicating directly with me: I was no longer a regular visitor to the school. However, there were nascent signs of continued wondering with pupils beginning to address each other about wondrous objects they had found, or asked questions of one another or shared online links to interesting phenomena. Strikingly, pupils who used the forum included those who had been core participants in the Wonder Box system in the preceding school year and those who had not. I was pleased to see evidence of continued wondering but accept that, given the spontaneous addition of the forum, I had not given much thought about how best to use it to scaffold propagation and this has impacted upon its success.

Looking back now on the system as whole, clearly one component interweaved throughout all of the phases was the focus on materials designed in relation to the dimensions of wonder. This focus on materials draws strongly upon my background as a conjuror where they have an intrinsic relationship to magic practice. Black Box, in
particular, was an interpretation of a magic show combined with a direct enquiry into wonder. As Chapter Five makes clear, much apparatus was required for this module. Using the dimensions helped to make choices about this apparatus. I knew that I needed each pupil to have a pen and worksheet. By working with the dimensions I created a scenario where a closed wooden box (novelty, mystery) resting on a plinth (status, meaning) with a printed sign (meaning) invited opening (interaction) to reveal good quality writing pens that were brightly coloured (novelty, status, surprise). The question for the design was how each of the tenets could be manifested. I considered each of the elements were considered using the tenets, influencing many choices even down to the choice of typefaces. These decisions were not made in a mechanical way to add or develop wonder. I would claim that this sort of attention to designed material is fundamental to the Wonder Box system: without it the phases could have occurred but not in the way in which I had conceptualised. The responses of pupils support this assertion as their exclamations voiced their approval and attention to the designed materials. Nonetheless, it is not possible to separate this factor out from all the other considerations that went into the Wonder Box system such that it can be asserted that it is a necessary component of a wondrous experience. Furthermore, by considering material design in such detail I am mindful of the challenge that teachers would face in replicating this approach within their classroom in terms of skills, costs, and time. For some teachers no doubt they would welcome this challenge and respond accordingly but for others it might prove an off-putting factor.

A second consideration to address is whether the heritages of wonder that I had identified during a review of literatures were helpful in their shaping of the phases within the Wonder Box system. My experience as magic practitioner had drawn me to a range of traditions such as conjuring, cabinets of curiosities, and nature tables. I found them to be fruitful seeds from which to grow my ideas. Nonetheless, the traditions explored here would themselves benefit from further investigation to explore how they operate and how education (and particularly wondrous education) might best make use of them. The work of Tomkins and Tunnicliffe (2007) suggest, for example, that there is great potential in the use of naturalia to stimulate pupils’ interests, and that there is significance in the way objects are presented to and shared with pupils. Similarly, Cabinets of Curiosities are diverse and, although there is a tradition of cataloguing and describing collections, there remain factors that are not well documented, the ‘magic power’ of these spaces. It is
likely that factors such as layout, sensuality, and the personality of the ‘host’, have significant effect on how we experience a Cabinet.

Furthermore, beyond these literatures there are other ways to develop work with wonder. Future studies could also seek to continue to expand the heritage that is suggested here. There are many cultures of wonderment not covered by this study, include the Happening, the Sideshow, and the Science Demonstration. The notion of a Wonder Box system is generous; there is no sense in which I am claiming that the eight heritages incorporated are the only permissible heritages to include. They have proved fruitful inspiration, but others, drawing upon different background, could replace my boxes with others or supplement this set.

7.3.2 The Three Goals of the Wonder Box System

The goals for the intervention emerged from the earlier cycles of research and were instantiated into each box within the system (see Chapter 5). In this section therefore, I reflect upon whether as a whole the system did achieve what it set out to do: to facilitate participants to experience wonder; to allow participants to construct and express their ideas of wonder; and to result in propagation. Furthermore, I consider whether the data generated by this study was sufficient to this task.

Firstly, many signs of wonder (‘wows’) and questioning could be observed or were attested to. This was seen directly in pupils’ behaviour (as they peered around closed doors, for example). It could frequently be heard in their discussions with one another, with myself, and with their teachers as they asked questions about objects found, displayed magic tricks, and recounted investigations. It was also evident, although more difficult to document, in their bodily postures, facial expressions, and vocal prosody. The frequency and widespread nature of these manifestations would seem to indicate that this goal was met.

Nonetheless, in reviewing the data it has become clear that this aspect of the research study could have been improved. In considering the observation of wonder and wondering what instrumentation would assist? As a magic practitioner I am accustomed to looking for signs of wonder from an audience of participants, watching faces, for example, for wide-eyes and gasps (Burger and Neale 1995). However, I failed to look for signs that wonder was absent: it is more than possible that it is easier to spot those children in the class who were demonstrably showing signs of wonder that those children who were not.
Consequently, it is hard to say for certain in any given stage exactly how many children experienced the positive affective aspects of wonder.

Secondly, the number of creative constructions generated by the pupils working with the boxes was considerable including clay models, tabletop displays, and songs, all of which were analysed for expression and communication of wonder. In addition, pupils directly expressed their ideas about wonder and wondering through questionnaires, reports, and posts to the forum. On the one hand, the value of making and displaying was clear. I was gratified, for example, at the industry that pupils displayed during Indigo Box. The design, developing, manifesting, and celebrating phases of the wonder education experiences were particularly focused upon pupil construction.

The range of work children produced clearly reflected different abilities and interests. The pupils who I talked with about their work seemed intent on meaningful expression. Constructions appeared to allow pupils to share interests (the geological tables during the White Box Wonder Smash) or explore ideas (the hormone table during the Wonder Smash) with one another as well as with me. Some children seemed to meet the challenge with capacity and enthusiasm and created wondrous displays with little support, yet for others, there was clearly room for increased facilitation and encouragement throughout the practice. Helping pupils in constructing and developing materials for these purposes is an area that needs further refinement. Guidance could come from the literature of creative pedagogy considered below (Thomson et al 2012).

Looking back, there were issues surrounding constructions being used as data. There was unexplored significance in the decision that I made during the exploratory research to collect examples of work as research grew. This decision was made in order to both continue to understand the realm of perceived wonder as required by the first research question, to look for ideas for the developing boxes, and, from the point of view of effective design, to check whether the materials provided appeared to help the pupils express themselves. As Chapter Five recounts, I experienced regret at removing children’s work for scrutinizing and interpretation, feeling ultimately that there would have been value in focusing on the display of constructed materials to further encourage and inspire the pupils. The development of the Wonder Table, for example, proposed as an array that would grow across the intervention to reflect both widening conceptions and the growth of activities, was possibly affected by the research decision to remove materials produced by pupils for interpretation. Had a future iteration been possible I would have looked for
ways to facilitate data collection while ensuring the support of pupils in their construction and sharing of manifestations.

Thirdly, successful propagation of wondering seemed to be reflected in pupil reports – participants who told me of their assembling of home cabinets, for example, and forum reports of pupils seeking wonder at weekends. Some of the display in White Box represented a propagation of interests stimulated in the earlier boxes (such as the fossil stall). It was also clear from the final visit five months later that interviewed pupils remembered the Wonder Box system fondly, and in total across the participants each box was represented. However, it is not clear from this how much they continued to actively engage with wonder once the classroom focus had turned elsewhere.

The study would have benefitted from a longitudinal dimension that would have allowed pupils the opportunity to consider their relation to wonder and wondering beyond the activities of the intervention. The idea of propagation, rooted as it is in a view of wonder as a phenomenon that can grow and develop (Bacon 1605/1915) has important consequences for an intervention like the Wonder Boxes. It is highly unlikely that even an experience as sustained as the Wonder Box intervention would have long term impact without continued nurturing. This longitudinal dimension would clearly also be needed to be confident in permitting a definitive answer to the propagative question.

7.4 Limitations of the Thesis

In reflecting on the thesis, there are many aspects of the research studies that could have been improved. Above, I have considered the nature of the data generated and whether it was able to attest unambiguously to the meeting of the three goals. But, in addition, three areas also stand out as limiting factors: a) a lack of co-design; b) limits in sampling; and c) need for iteration.

7.4.1 Co-design

Throughout the design and implementation of the Wonder Box system I had worked with teachers in various roles: Mr Oak most intensively but in addition Mrs Rose and Mrs Vine at Rabbit Island; John at Water Falls; and Amy at River Run. The teachers at Rabbit Island took the Wonder Box intervention in their stride, working it variously into their classroom pursuits in my absence, and supporting its effective running during the pursuit days. Reports provided by John and Amy reveal their professional expertise, with their imaginative adaptation of the intervention I was attempting to share and their concomitant
sensitivity to the study. Nonetheless, the Wonder Box system was my vision, developed from my background as a magician. As such it did not fully address how teachers might envisage a classroom experience of wonder.

Clearly there is a way forward for the study of wonder in schools which acknowledges teachers as ‘expert(s) of their experience’ (Sleeswijk, Visser et al. 2005, p.12) and positively expands their involvement. The literatures of teacher professional development offer insight into established practice conducive to the design of educational wonder (Villegas-Reimers 2003). For example, Guskey (1995) considers challenge, teamwork, ‘thinking big but starting small’, and feedback as important factors for an ‘optimal mix’ of participation. A propagation of research into wonder would require a shift of methodology from one that centres on a practitioner-researcher as a responsible, influencing, creative, and opportunistic agent (McNiff and Whitehead 2006) to one that allows a large, possibly distributed body or network of agents to work together. Co-design, for example, which was rejected as a methodology at the outset of the study because of its requirements from teachers and researchers, looks to be a good match for an expansion of research into educational wonder within the Learning Sciences tradition.

Roschelle and Penuel (2006) provide guidance on co-design with teachers:

1. Co-design takes on a concrete, tangible innovation challenge.
2. The process begins by taking stock of current practice and classroom contexts.
3. Co-design has a flexible target.
4. Co-design needs a bootstrapping event or process to catalyze the team’s work.
5. Co-design is timed to fit the school cycle.
6. Strong facilitation with well-defined roles is a hallmark of co-design.
7. There is a central accountability for the quality of the products of co-design.

I would add that when working with such a rich and diverse concept as wonder, there is also the desirability for co-designers to consider the heritage of wonder. Point Two above might thus be extended to read:

- The process begins by taking stock of current practice and classroom contexts and continues by taking stock of past practices and contexts beyond the classroom.

How best to share, celebrate and propagate wondrous educational experiences? In an expansion of the Wonder Boxes under co-design, I wonder about schools creating their own variant Boxes containing artefacts to spark another school’s journey, in much the
same way that John’s class wanted to prepare a time-capsule to hand on to their successors. Perhaps a combination of easily realized instructions, as began to be explored in this thesis, and wondrous materials could be evolved in an extended informative game of ‘pass the parcel’, with participants changing the parcel of wonders as it circulates.

This study was offered a glimpse of the potential for digital technologies to allow for the sharing of ideas and the curating of materials in the fortuitous but unplanned development of the school virtual wonder space described in ‘Glass Box’. I can envisage a distributed community of co-wonderers developing their own ways with wonder, and using digital space to create a virtual Cabinet of Curiosities in which to evoke, construct, and propagate wonder.

7.4.2 Limits in sampling

In keeping with the tradition of action research, my sampling strategy was not probabilistic in design but was based throughout on opportunistic sampling. Although such an approach clearly limits generalizability (not a key requirement for action research) its advantages in ease of access and quick response in this case outweighed its costs. My working at Rabbit Island was initiated through a teacher known to a colleague and motivated also by my ability to reach it by bus! In addition, there was a specific problem in the sampling in the exploratory cycles as I became aware after the first batch of street interviews that there was a lack of input from children. The exploratory research had moved from the university to the streets, in the hope of an increasingly wide sample. However, by the conclusion of the second batch of street interviews, only 56 children’s voices were present. Given that the intervention was designed to help children experience educational wonder in a classroom it was an oversight not to have canvassed children in a school environment earlier on.

7.4.3 Iteration

Action research necessitates cycles of iterative practice (McNiff 2002; McNiff and Whitehead 2006) and so in moving from the exploratory cycles to the Wonder Box system it was possible to test out and then redesign aspects of the intervention. That notwithstanding, there was no iteration on the aspects of the Wonder Box directly. Materials were created specifically for each box and (rarely) was there time to trial them prior to their use in the classroom. Whilst I used my experience and intuition to design materials that embodied dimensions fully, there was not time to trial alternatives. For
example, I had one attempt to create a mysterious classroom for Black Box – whether other designs would have been more successful in creating the experience I wished to engender I do not know. Moreover, the activities themselves drew from earlier cycles but again each was developed uniquely for the school investigation and it was not possible to pilot them. Finally, the Wonder Box system itself was only run through once. In an ideal world with unlimited time for doctoral research, I would have repeated the whole experience again in another school (working with co-design as specified above).

7.5 Future Work

In this upcoming section, I review briefly how the pedagogical debate has changed since the empirical stage of this research was undertaken and talk about how I have continued to work with wonder in my current career.

7.5.1 Building on Insights from Creative Pedagogical Practice

There are many fruitful studies in pedagogy and creativity that have arisen following the establishment of the National Advisory Committee on Creativity, Culture and Education and since the empirical work conducted for this thesis (Thomson, Jones, and Hall, 2009; Thomson, Hall, and Jones, 2010; Bragg and Manchester, 2011; Thomson et al, 2012). These studies suggest considerable ways forward with educational wonderment. Thomson et al (2012) provide an inventory of 19 creative pedagogic practices. Although all of the practices can be seen as potentially sympathetic to working with wonder (e.g. costumes, use of routine), eight practices are particularly resonant with the Wonder Box system:

1. Provocation
2. Use of artefacts
3. Moving out of the classroom
4. Making an occasion
5. The creation of a rich narrative environment
6. The valorisation of collective endeavour
7. The use of open-ended challenge
8. Permission to play

Such desiderata underscore the vision of wonder-based practice being rooted in the direct experience and exploration of the manifestly wondrous (points 1 and 2), within a structure that allows for expansion (3, 7), construction (5, 6) and positivity (4,6,8). It is clear that there are some potentially significant connections to be made between educational wonder
and creative teaching. Traditions are presented below in Table 36 in alignment with the practices they promote:
<table>
<thead>
<tr>
<th>Practices</th>
<th>Some Connections to Wonderment</th>
<th>Sympathetic Practice from Heritage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provocation</td>
<td>Simulating participants’ desire to know through an e.g. ambiguous, strange thing or happening.</td>
<td>Conjuring Cabinets of Curiosities Object Lesson</td>
</tr>
<tr>
<td></td>
<td>Similar to conception of wonder as encounter with wondrous object, artefact etc.</td>
<td></td>
</tr>
<tr>
<td>Use of artefacts</td>
<td>The ‘treasuring, display and curation of everyday objects.’</td>
<td>Conjuring Object Lesson Cabinets of Curiosities</td>
</tr>
<tr>
<td></td>
<td>Making meaning through the manifest. <em>Anschnauung</em></td>
<td></td>
</tr>
<tr>
<td>Moving out of the classroom</td>
<td>Outdoor pursuit and the consideration of space beyond the expected realm.</td>
<td>Outdoor Pursuits Nature Tables Labyrinth</td>
</tr>
<tr>
<td></td>
<td>Transforming the class into something ‘other’</td>
<td></td>
</tr>
<tr>
<td>Making an occasion</td>
<td>Constructing an expressive experience and producing positive transformation</td>
<td>Conjuring Cabinets of Curiosities</td>
</tr>
<tr>
<td>The creation of a rich narrative environment</td>
<td>Multiplicity of manifestation and interpretation. Constructing meaningful displays.</td>
<td>Nature Table Cabinets of Curiosities</td>
</tr>
<tr>
<td>The valorisation of collective endeavour</td>
<td>Shared experience encouraging expression of individual interests in collaboration; kindness.</td>
<td>Conjuring Nature Table Outdoor Pursuit</td>
</tr>
</tbody>
</table>
The use of open-ended challenge

Pursuits and structures with propagative roots and seeds (spin-offs, inspirations, reactive events).

Labyrinth
Nature Table
Outdoor Pursuits

Permission to play

Positive environment in which playful interaction, even carnivalesque, is encouraged and assisted.

Cabinets of Curiosities
Outdoor Pursuits
Labyrinth

I suggest that there is considerable value in exploring these practices in conjunction with the focus of wonder. It strikes me, for example, that the concept of ‘provocation’ in creative pedagogy is sympathetic to the concept of wonder presented in this thesis. The heritage offers a multitude of practices and ideas, which would greatly assist in the pursuit and understanding of positive creative pedagogy and educational wonder, and vice versa.

7.5.2 **Ongoing Work in Wonder**

My own practice has continued to develop beyond the remit of this research and can be seen as a propagation of this study. Four years ago, I was given the opportunity to continue research and design and, most importantly, foster wonder in a secondary school in Nottingham by setting up my interpretation of a Cabinet of Curiosities. I seeded the room with objects and artefacts from my own collection, choosing items according to what I had learnt through my exploratory and school research, enjoying dialogue with the design tenets descried during the exploratory work, sourcing things that were novel or mysterious, for example, and always with an eye on the potential learning journey these items presented. I considered all subjects taught at the school and ensured that they were all represented amongst the collection. Most important of all, though, was the consideration that these were exploratory ‘ways in’ and more would follow, with, it was hoped, the school community being inspired to contribute ideas and exhibits.

As with the study, the examination and sharing of wonder is at the heart of the space we have come to know as the Wonder Room. Multiplicity characterizes the room – multiple possible experiences, multiple exhibits, multiple opportunities. I am on site several times a week, when I work with pupils and staff. On days when I am not there, teachers and staff use the room to suit their needs. The Wonder Room is used for teaching, as a
resource, as a break-out space, as a reward for pupils, as a place for mediation and meditation. Colleagues tell me how they visit the room for ideas for their teaching, or simply to take a moment for reflection.

Essential to the room’s success is the accessibility of the materia medica. When pupils visit I encourage them to spend the first five minutes in exploration of the room’s contents. Inevitably, a pupil will come to rest at an item, ask questions, and examine the item. This moment of engagement is often the beginning of sustained and repeated interaction, with pupils becoming participants in wonder, returning to visit the exhibit, to ask more questions or propose answers, and to volunteer work in the form of reports or artefacts.

It is only with time that I came to a perspective of the room as an ‘exploded’ set of Wonder Boxes. This is how I perceive the connections:

- **Black Box:** All visitors to the Wonder Room are considered to be participants in the exploration and sharing of the realm of wonder. They explore metaphorical black boxes. Manifestly, there are collections of boxes, some open and some sealed, that provoke wondering at and wondering. The room holds closed, evocative exhibits that provoke questions and guesses. There is a plaque that asks ‘What Does Wonder Mean to You?’

- **Red Box:** Pupils, staff, and visitors contribute objects and artefacts as either donations or loans. Some bring in wonders either in the form of written work, images or objects and artefacts. The donations are catalogued by myself, pupils, and staff. There has not been a week when contributions have not been made. To date, donations include: a nest, a kaleidoscope, a badge collection, a fox skull. I keep a number of small boxes which pupils borrow and return with items they have found.

- **Orange Box:** ‘scavenger’ pursuits happen on certain days when pupils visit me to show the dead moths and beetles they have collected within the school and the school grounds. Reference works and magnifying glasses have proved helpful in the appreciation of these finds. Pupils also use Image Searches on their Smartphones to assist in identification.

- **Yellow Box:** the room has a Nature Table which staff and pupils maintain. There are pine cones, tadpoles, seeds, and leaves. Living things, especially insects, afford conversations about wonders such as metamorphosis and parthenogenesis.
Pupils create their own labels for the displays. Currently this is a spontaneous activity. Examples include labels for specimens (‘Goose Barnacle’) and questions or challenges: ‘Can You Solve This Puzzle?’. Recently, pupils have been making promotional materials for the Wonder Room, including posters and users’ guides. Again, this is spontaneous, voluntary work: a propagation of the tradition.

- Green Box: the room is itself a Cabinet, with other Cabinets nested within. Some of these Cabinets are curated and docented by the pupils.

- Blue Box: I like to think that the Wonder Room is a way of bringing other worlds together, so that the room itself is a world to explore. Unexpectedly, but gratifyingly, the room has had many visitors from teachers from other schools, who visit to observe the room in action and inevitably join in the co-wondering.

- Indigo Box: The room affords the sharing of ideas and the construction of projects. Teachers have used the room for timed exercises, or for inspiration for productions. There is a ‘Wonder Wall’ upon which pupils, teachers, and visitors pin their wonderings, ideas, and suggestions. Projects have arisen within the room from pupils’ interests, sparked by an encounter with an object or artifact. A ‘pool’ of typewriters and access to pens, pencils, and paper appear to have had a propagative effect.

- White Box: The energy of pupils and their use of the room means that there is the element of ‘festival’. Pupils appear to have favourite items about which they have a degree of ownership. I have witnessed pupil demonstrating and explaining objects and artefacts to peers, teachers, and visitors.

The propagative nature of the Wonder Room might be further discerned in the fact that the space continues to grow and evolve. There is regularly a sense of the beneficial unexpected: new arrivals, pupils returning with new ideas, surprising connections. To date, the room has inspired eighteen schools to start their own wonder spaces, following visits from teachers, and communications from these teachers suggest that their schools are experiencing the propagation of wonder. The Wonder Room, like all Cabinets of Curiosities, is work in progress. The collections, connections, and propagations are manifestations of the input of others.

Finally, to return to the expectation of ‘spiritual, moral, social and cultural development’ (Ofsted 1994) as described in Chapter Two. In their ‘Section 5’ inspection of May 2012 the inspectors had this to say about the Wonder Room:
The academy uses the expression ‘the guiding principle of wonder’ and genuinely promotes an enquiring mind. One of the best examples is the ‘Wonder Room’ (a room full of weird and wonderful artefacts from nature, science and history) which provides students with a treasure of experiences. As one student told an inspector who asked how one scientific artefact worked: ‘That’s the wonder of it sir, nobody knows.’ (Ofsted 2012).

7.6 Final thoughts

This dissertation is a practitioner’s Cabinet of Curiosities. The search has been wide, and has aimed to explore and represent a phenomenon usefully. At the heart of this multifarious study there have been two simple questions about wonder and its educational evocation. From this beginning, much has emerged. It occurred to me that despite all the possible anatomies of wonder and toolkits for thaumaturgy, despite the boxes and cabinets and materia medica, there is no wonder without people wondering. Educational wonder is predicated on people wondering together. This thesis suggests that there are many ways of facilitating or encouraging these opportunities. I hope that, in its rhizomatic nature, for all of its nodes and lacunae, this thesis has demonstrated that they can be successfully developed, manifested, celebrated, and propagated.
8 References


(DfEE/QCA 2011a)


DfEE/QCA (2011b)


National Advisory Committee on Creative and Cultural Education (NACCCE) (1999). *All our futures: Creativity, culture and education.* London: DFEEE.


Appendix 1
BOXES OF WONDER?
A playful system for the investigation and generation of wonder and learning

Quick Start Guide

READ ME!

This is the first draft prepared by Matthew McFall and Wonder Workers in the United Kingdom for John and his Wonder Workers in Canada. Hi, John! You must promise to treat this guide with kind but critical eye, and with permission and encouragement for you to elaborate/ adapt this guide itself and all other materials, such as the Game Cards or Letters, should you have time or inclination. By preparing your Exhibit of Wonder/Red Box/Black Box combo, for example, you will already have had helpful thoughts about and insights into designing for wonder. The Boxes you have chosen will have a direct influence on the imaginations of the participants. It’s a quantum box experiment! Be watchful and have fun!

I’d be thrilled if you kept a log of any of your thoughts/observations – both as scientist and artist. This document, extracted from a longer Handbook, is, I hope, just enough to be useful and catalytic, given our mercurially fast turnaround before March Break...

Some Aims and Objectives

Via a sequence of activities we hope to explore wonder’s many realms (or wonder wonderfully about wonder, wonders, and wondering) and approach the (re)search with wisdom, play, and good scientific and artistic practice. Materials generated as part of Black Box generate a resource and inspiration and tool for the wonder work that continues with Red Boxes, Green Box, White Box etc. We hope, amongst other things, that characteristics of the activities might include: interest, engagement, joy, curiosity, play, questioning, creative thinking, insight, appreciation, learning, memorability, inspiration...

A sense of gradual flowering, or emergence, or potential, is fostered by the movement of Black Box from the secretive nature of the Participants’ Ballot and Cell work, to shared pondering and generating during Table Arrays and Visits. The finale of this Black Box will be the class working together to construct a ‘Wonder Wall’. The expansion continues with the Red Box quest, introduced at the end of the Black Box module. Pupils will be briefed about and discuss going out into the world to seek and find wonder(s). ‘Red Boxing’ will lead to a show-and-wonder event (March/April), where
parcels will be opened, presented, and discussed, and materials will be associated/integrated with
the Black Box Wonder Wall. The expansion will continue in Green Box, when we present our proto-
museum or show room or Happening to an invited audience. In the Primary Wonder Project, the
class created a wonder happening for the year group, also taking the opportunity to collect
conceptions of wonder for continued inspiration. The year group then worked together for the Blue
and Indigo Boxes. And in White Box, a wonder and learning event was put on by the whole year
group for the entire school.

This sheet and accompanying materials (Black Letter, Game Cards, Red Letter – below) give the
teacher/instructor/principal investigator/facilitator/mentor/Wonder Worker (hereafter
‘teacher’, referred to in the Letters as ‘Designated Investigator’) sufficient information for the first of
the Box wonder-learning happenings to occur!

Black Box runs for approximately an hour. Read through Game Cards for suggested timings and
amend as you see fit.

**Products and Data**

By the end of Black Box, the following things should have come into being:

1. ‘Ballot cards’, prepared by pupils in secret, guessing what might be found in a Black Box.
2. ‘Wonder Cells’ – squares of white paper upon which pupils represent wonders.
3. Table arrays presenting these individual conceptions of wonder/‘cells’ for considering/
   sharing etc.
4. A Wonder Wall representing pupils’ early (and ‘fresh’) conceptions of wonder – a reference
   point/tool/resource for future work (Red Box etc)
5. Photographs of the displays
6. Pupils’ emerging notes
7. Reflective teacher or observer report

Please see the section ‘Collecting’ for more thoughts and suggestions.

**Preparation**

**Materials**

The first three items below are part of this document – see below. Hopefully the other items are
easily acquired but improvisation is allowed!

1. Black Letter. The teacher reads this out and catalyses investigations.
2. **Black Box game cards.** These are read out, in sequence, continuing pursuit of wonder.

3. **Red Letter.** This is attached to the Red Box. The letter is read out towards the end of the session, instigating searches for wonder further afield.

4. **Black Envelope containing Black Letter (see above) and Ballot Cards.** Consider: How big is the envelope? Does it have a red seal? It should be big enough to hold the Ballot Cards (below).

5. **Red Envelope containing Red Letter (see above), attached to Red Box.** The Red Envelope is, perhaps, marked ‘READ ME’. It might carry an instruction. E.g. ‘Do not open this envelope until the Game Cards have been investigated.’

6. **Ballot Cards for recording guesses about the Black Box ‘Mystery Object’.** Size and materials matter. A6 cards? Blank pasteboards? Slips?

7. **Exhibit of Wonder selected by teacher/operator.** This will not be opened until the Red Box class event.

8. **Red Box constructed by teacher to hold Exhibit of Wonder**

9. **Black Box sourced by teacher.** Contains Red Box, Red Envelope, and Game Cards (cf. Set Up, next section)

10. **Paper squares for Wonder Cells (3 per pupil, plus spares)**

11. **Post-It Notes (1 pad per group) or Index Cards.**

12. **Tables for group arrays**

13. **Pens**

14. **Board or wall for construction of Wonder Wall**

15. **Sticky tack or map pins for fixing squares to wall or board**

**Set Up**

View Game Card instructions later in this document. Check timings and clarity. Format so that each card can be printed out as individual card. Print out Game Cards on cardboard. Pupils will not necessarily view the cards, which are read aloud by teacher.

Print out Red and Black Letters on letter paper.

Place Exhibit of Wonder in Red Box and seal box, ensuring the exhibit cannot be identified. Put Red Letter in Red Envelope and attach to Red Box. Place Red Box in Black Box. Check Game Cards are in sequence and secure them (paper band? rubber band? clip? etc.) and place on top of Red Box. Close Black Box. Put Black Box on display where it can be seen but not handled by pupils e.g. teacher’s table. A cloth might be used to cover Black Box before game begins.

Put Black Letter in Black Envelope with sufficient Ballot Papers. Spare ballot papers should be available. Place envelope close to the Black Box.

Consider what pupils see when they first enter the room.
Pupils for first phases of game should be at desks in groups of 5 or so.

What Happens

Pupils enter classroom, see intriguing Black Box, take their places at desks. When the teacher and pupils are ready the game begins. This phase of the game is initiated simply by teacher opening the Black Envelope and reading the Black Letter...

Teacher opens Black Envelope and reads Black Letter, initiating their production of the first wonder data set. Ballot Cards are distributed. Without conferring, pupils write down and draw their guesses as to what is in the Black Box. These ballots are collected in by teacher but not ‘shared’ by the class. Consider them an ‘admission fee’. This data set can be looked at by teacher, but not when observed by pupils. Ballot tickets to be scanned and sent to Nottingham to assist future work.

Continuing to follow the instructions in the Black Letter, the teacher opens the Black Box...

The teacher removes contents of the Black Box. (Consider timing, approach, prop management...Teacher might remove cards first, then remove Red Box. The teacher might read the Red Envelope attached to the Red Box, asking that the Game Cards are read before the envelope is opened. It is hoped that the activities of the game cards might be sufficiently absorbing that the Red Box is forgotten for a while, making the return to the Red Box toward the end of the session a pleasant surprise.)

The teacher reads out the first Game Card and the game continues.

Pupils work at desks. They begin by working individually, producing visualisations, conceptions, sketches, doodles etc. of wonder. Then they will work collaboratively at their tables to make table display for discussion. If possible, pupils will document their proto-cabinet of curiosities by photographing their layouts. Any new thoughts arising or comments (e.g. what different ways of responding to wonder are there? Do we share wonders?) can be written on sticky notes or index cards. These might prove valuable clues for designing our Green and White Box events... Pupils will then be allowed to circulate and look at the work of other tables, with possibility of docentage from creators. The final Black Box exercise will see pupils working together to make a Wonder Wall – a display showing and making sense of their varied responses, an inspiration and seed bed for the box work to follow.
**Tips for Presenting Black Box**

Embrace the mystery! But ahead of time, if possible: Prepare by running through materials and running order, and considering wording of instructions for clarity, checking for ‘bugs’. Consider that the choice of materials, seating, coincidence etc. all play their part. Plan for and observe the flow of proceedings. Are the suggested timings good? Where might we find new ways of adding and allowing wonder and wondering without undue bias?

**Collecting**

The Black Box will generate several ‘datasets’. Similar sets produced as part of the Primary Wonder Project have been part of an inspiring storehouse of wonder for help in designing and developing.

Set One: Ballot Cards with participants’ guesses as to what is in the Black Box. Words and pictures encouraged.

Set Two: ‘Wonder Cells’: Paper squares (3 per person, negotiable) upon which participants have drawn/ written recorded something that makes them (feel) wonder. Diverse things have emerged through earlier pursuits: pictures of sprouting seeds, a sketch of a flame, a landscape of mountains, a butterfly-brain hybrid, the word ‘music’, a symbol, a keyhole, a box...

Set Three: Photographs of participants’ table displays, made by participants in process. The arrays consist of Wonder Cells presented on a table by creators. Photographs are taken by participants of their sorted cards, and of the display as seen by visiting tables.

Set Four: Any notes or records made by participants as they view, interpret, sort, present etc. the curiosities of Set Two.


Set Six: Write up notes about the Black Box. What worked? What didn’t work? Any highlights? What would you do differently? Did anything surprising happen? What do you think was learnt?

Set Seven: Photographs of the Black Box. Images of the Box in situ. Miscellaneous data arising.
Ideally the sets are later complemented by Set X: participants’ feedback about the whole Black Box experience. Memories, highlights, suggestions. Prototype questionnaires, memory charts, design sheets are in existence and in process, but will not be required till after Red Boxes.

**Design Interlude: Boxes, Happenings, and Quantum Collapse....**

How can we avoid limiting or constraining participants’ guesses? What sort of boxes generate wondering, a desire to investigate, look inside..? MM has carried out a number of ‘Pandora Games’ in workshops and as part of the Primary Project. MM learnt many things about boxes and affordances. If a single box is being used, as in Black Box Canada, a good bet might be an unadorned black wooden box large enough to hold a bowling ball. As participants will be allowed examine the Black Box visually (in the case of other investigations, smell and sound), but will not be allowed to touch, every detail of the outside of the box will carry significance and influence. Consider a red sticker placed somewhere on the box. If hinges are visible, they might suggest design or culture. How old is the box? Is it ancient? Modern? Alien? The Wonder Workers suggest these key words in selecting/ constructing the Black Box:

Mysterious

Ingenious

Status

Feel free to add key words to the above list.

After White Box, and possibly for Green box, we will ask participants how they themselves might design/produce a Black Box for maximum curiosity and wondering.

**Important Materials**

There follows:

1. Black Letter
2. Red Letter
3. Game Cards (preliminary texts for adjustment by Teacher)
INVITATION

Greetings from the United Kingdom!

The Black Box you see before you has been made to help you set off on a journey into wonder.

Your Designated Investigator will shortly continue the process simply by opening the box.

But before that, we would like to know one thing from each of you. Our question and your responses will assist our journey of wondering.

The question is:

What is inside the Black Box?

Ballot Cards have been provided for you to register your ideas, your guesses, your visions. Work without conferring. Think inside the box. Feel free to write, feel free to draw. Keep it secret.

When completed your cards should be returned to the Black Envelope.

The Black Envelope and your ideas will be dispatched to us for consideration.

When all responses have been collected and the Black Envelope sealed, it will be time for the Black Box to be opened by your Designated Investigator.

We wish you much wonder and wondering.

The Wonder Collective
SEEKING WONDER

Our quest for wonder has only just begun. The mysterious Black Box is just the first, and its opening symbolises the beginning of our wondering. Your next step is to continue the search for and sharing of wonder.

Introducing... Red Boxes...

Is it possible to collect wonder and wonders? Inspired, perhaps, by the Wonder Wall, inspired, perhaps, by your wondering and wandering in the weeks to come, can you locate objects and artefacts that connect with wonder and wondering? Can you find and collect wonderful things?

Here’s the deal: Go out into the world and seek Wonder!

Collect wisely and considerately.

Make Red Boxes to hide and protect your items. There are no limits or rules to how you might design a Red Box. You can design a net for a cube or tetrahedron, or wrap your exhibit in red paper.

Bring your Red Boxes to this room and assemble a table of Red Boxes near the Wonder Wall.

The Red Boxes, including the Red Box to which this letter is attached, are not to be opened until {date} when we will enjoy the next Wonder Event, a new sort of show-and-tell...

Expand and support your collecting by keeping a journal or notebook of wonders. Make notes about your encounters with your own or other people’s conceptions of wonder. Ask around. Talk to your families and friends. Look for Wonder wherever you wish. Be a good investigator. Look for clues, connections, and variation. Ask questions: What does it feel like to wonder? How do people experience wonder differently? What is a wonderful thing? What do you wonder about? What have people wondered about in the past? What might the future of wonder be?

Any questions?

We wish you a wonderful time, and much happy wandering.

The Wonder Collective
The ‘Game Cards’ follow. Consider each numbered section a separate card to be printed out. Amend timings and text as required to help presentation and catalyse.

0.
Wonder Learning Collective
BLACK BOX
Nottingham, England, 2010

1.
Our quest is to investigate wonder’s many aspects and explore how wonder might help us to learn.

2.
Time for a Wonder Storm!

Phase 1 – Setup
Get into groups of equal sizes. Before beginning, each person needs three paper squares and a pen.

Between now and beginning the next phase think about things that make you wonder. Do not discuss your ideas.

Phase 2 – Wondering About Wonder
Without showing anybody else, write, draw, scribble, doodle or in any other way express some things that make you wonder.

You have 5 minutes. Produce 3 separate Wonder Cells each.

3.
Sharing Wonders, Part 1

The room is beginning its transformation into a Wonder Space.

It is now time to share and explore your wonders.
When given the signal, place your squares on the table for everyone in your group to look at. What different ideas have you come up with? Do you have wonders in common? How do we experience wonder differently? What are we trying to communicate in our words and pictures? Do our collected ideas make us feel differently about wonder?

Make a note of anything that you find interesting. Take photographs of the work as you construct it. Log any ideas along the way. You have 5 [10?] minutes.

(Give signal)

4.
Sharing Wonders, Part 2

You will soon be having visitors to your table. At the same time you will be free to visit other tables. But first: are you happy with your display? Will members of your group take it in turns to welcome visitor or act as welcomers, curators, and docents?

You have ?3 minutes to consider.

(Give signal)

5.
Sharing Wonders, Part 3

At the signal, take ten minutes to explore other tables’ wonders.

(Give signal. Time 10 minutes. Teacher: observe/ record/ make process notes if possible)

6.
The Wonder Wall

Now is the time to represent our conceptions of wonder as a collective. Together use a blank wall or board to display, connect, arrange, and express your ideas, thoughts, feelings and examples of wonder. Begin with the Wonder Cells you have produced. Use additional notes and cards, as needed.
This Wonder Wall will be a useful inspiration for investigating and generating wonder and wondering.

You have 15? minutes

7.

Now you have built your Wonder Wall, it is time to continue the search.

The Designated Investigator will now continue the investigation of the contents of the Black Box.

(Designated Investigator opens the letter attached to the Red Box but must not open the Red Box!)
A Fool’s Guide to Wonder Boxes: Red, Orange, and Yellow

‘Wonder... is the seed of knowledge...’ Francis Bacon (1561-1626)

In a Nutshell

The Wonder Boxes are a playful system designed to catalyse and assist in the exploration and generation of wonder and wondering. The boxes progress from the mysterious Black Box, which collects from participants their thoughts about wonder, to a White Cube event – a wonder happening or museum constructed in the school for the benefit of the whole school. Between the mystery and the show, there are a spectrum of boxes, of which each box holds different meaningful pursuits: Red and Orange Boxes focus on seeking and collecting, Yellow and Green on arranging, researching, making, and presenting. Blue Box sees the opportunity for wondering ‘in the field’ and suggests ways of ‘wonder visiting’. Indigo Day is a day of wondering, making, incorporating, and preparing for the ‘season finale’, the White Box Event...

For the Primary Wonder Project, one of the joys was the sense of expansion and transformation. We moved from working individually and secretively in Black Box, to working in teams, to collaborating as a class. As a class – with energetic and different ways of working – we put on a happening (called a ‘showroom’ or a ‘wonder smash’ by participants) for the rest of the year group. The entire year group then worked together on a field trip and continued the work on an Indigo Day, producing a happening for the entire school. This expansive model might be considered a paragon, though alternative journeys could prove equally desirable routes to wonderful learning experiences.

This document recounts previous work, with suggestions for making it all happen, and with emphasis on flexible transferability and ease of use. It is hoped to provide enough structure to inspire confidence and meaning, and to leave sufficient space for the innovations of teachers, pupils, and other wonder workers.

This first draft is prepared for research associate John and co-wonder-workers in Canada. Their experiences, productions, and responses will assist in the continued shaping and design of helpful and catalysing wonder materials, and, it is hoped, will form part of the study and a journal article. Thank you!

Suggestions for working Red, Orange, and Yellow Boxes are presented here. A Green Box is being prepared, as are suggestions for Blue Boxing, Indigo Day, and the White Box Happening.
Timings for Boxes are suggested in this document, but should be viewed as a rough guide. Wonder workers should consider whatever is practical, and are encouraged to adapt pursuits as they see fit.

A Wonder Journal, including a timetable, observations, successes, failures, and wisdoms might be kept as part of work.

A critical consideration of this document itself would be helpful – how further to assist any teacher preparing for Wonder Boxes? Can a Golden Lesson Plan be crafted? How to support participants?
Table 1: An Overview of the Wonder Box System:

<table>
<thead>
<tr>
<th>Box</th>
<th>Participants</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Class, Teacher, Optional Principal Investigator</td>
<td>‘Launch’ event. Pupils enter transformed classroom for sequence of imaginative games and initial generation of conceptions of wonder, including guessing the contents of box(es), preparing displays as teams, and constructing a Wonder Wall as an emergent resource.</td>
</tr>
<tr>
<td>Red</td>
<td>Class, friends and families outside school, Teacher, PI</td>
<td>Pupils seek conceptions and objects/artefacts of wonder in the world around them. Collected items are concealed in crafted boxes &amp; form heart of Wonder Table. Items are revealed and presented via ‘speed object lesson’.</td>
</tr>
<tr>
<td>Orange</td>
<td>Class, Teacher, PI</td>
<td>Timed hunt for wonder taking place in school grounds</td>
</tr>
<tr>
<td>Yellow</td>
<td>Class, Teacher, PI</td>
<td>Arrays of collected items and supplementary materials prepared and presented. Wonder Wall and Table are added to.</td>
</tr>
<tr>
<td>Green</td>
<td>Class, Entire Year Group, Teachers, Staff, PI</td>
<td>A cabinet of curiosities is considered and new inclusions are crafted by pupils. Prototype displays and constructions of wonder are created incorporating previously harvested materials. Wonder ‘happening’ is assembled; entire year group visits.</td>
</tr>
<tr>
<td>Blue</td>
<td>Entire Year Group, Teachers, Staff, Experts, PI</td>
<td>Wonder Quest field trip. Day of events in teams investigating wondrous experiences culminating in displays and presentation.</td>
</tr>
<tr>
<td>Indigo</td>
<td>Entire Year Group</td>
<td>Day of review, conception-generating, prototyping,</td>
</tr>
<tr>
<td>Teachers, Staff, PI</td>
<td>research, and preparation for White Box Wonder Event.</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>White</strong></td>
<td><strong>Entire Year Group, Entire School</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School-wide happening. Redolent of wonder traditions such as sideshow, museum, ride, cabinet of curiosities. Multiple conceptions of wonder displayed and collected.</td>
<td></td>
</tr>
<tr>
<td><strong>Glass</strong></td>
<td>Web-based Wonder Room, moderated by the Investigator, as place of continued wondering, collecting, displaying and reviewing of wonder events.</td>
<td></td>
</tr>
<tr>
<td><strong>Mirror</strong></td>
<td>Reflective iterations, the next wave, of which this document is an example.</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Some things generated by the Wonder Boxes

<table>
<thead>
<tr>
<th>Box</th>
<th>Productions</th>
<th>Additional Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td><strong>1° (Primary Wonder Project):</strong> Golden Envelopes; Conception Sheets; Charts</td>
<td>Video Recording; Sound Recordings; Photographs; Teacher Report</td>
</tr>
<tr>
<td></td>
<td><strong>2° (Current wave):</strong> Wonder Ballots, Wonder Cells, Wonder Table Arrays; Wonder Wall</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>Red Boxes: collected objects and artefacts; Wonder Passports; Wonder Table</td>
<td>Video Recording; Photographs</td>
</tr>
<tr>
<td>Orange</td>
<td>Collected objects; photographs; accounts</td>
<td>Video Recording; Photographs</td>
</tr>
<tr>
<td>Yellow</td>
<td>Arrays: objects and artefacts collected; ‘museum labels’</td>
<td>Video Recording; Photographs</td>
</tr>
<tr>
<td>Green</td>
<td>Cabinet response sheets; Modelling Clay curiosities and museum labels; Artefacts; Pupil-generated conceptions; Display materials</td>
<td>Video Recording; Photographs; Artefacts</td>
</tr>
<tr>
<td>Blue</td>
<td>Accounts; Artworks; Field Report</td>
<td>Photographs; Expert reports</td>
</tr>
<tr>
<td>Indigo</td>
<td>Wonder Horse; Prototype displays, materials etc.</td>
<td>Photographs</td>
</tr>
<tr>
<td>White</td>
<td>Displays, materials, conceptions etc.</td>
<td>Photographs; Video Recordings; Expert reports; semi-structured interviews;</td>
</tr>
<tr>
<td>Glass</td>
<td>Accounts (individual and collaborative)</td>
<td>Transcripts</td>
</tr>
<tr>
<td>Mirror</td>
<td>All of the above, encore!</td>
<td></td>
</tr>
</tbody>
</table>
Making Time for Wonder?

You might like to fix up a timetable for Boxes. You are encouraged to be pragmatic and ingenious!

The following is a guide based on previous work:

Table 3: Suggested Timings for Boxes

<table>
<thead>
<tr>
<th>Box</th>
<th>Time Suggested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>If you are reading this, you have already Black Boxed! A lesson is plenty. Cf. Quickstart Guide.</td>
</tr>
<tr>
<td>Red</td>
<td>A lesson for the first opening of Red Boxes. Repeat visits to Red Boxes as work continues – planned or opportunistic.</td>
</tr>
<tr>
<td>Orange</td>
<td>A lesson, possibly combined with Yellow</td>
</tr>
<tr>
<td>Yellow</td>
<td>A lesson, possibly combined with Orange</td>
</tr>
<tr>
<td>Green</td>
<td>Two or more lessons, if possible. For Primary Wonder Project we used two days: from 11.00 to 15.30. Two lessons could cover admirable materials and catalyse further work, including homework.</td>
</tr>
<tr>
<td>Blue</td>
<td>A day</td>
</tr>
<tr>
<td>Indigo</td>
<td>A day, afternoon, or a number of lessons, with homework</td>
</tr>
<tr>
<td>White</td>
<td>A day, possibly sequence of lessons? Primary: the morning was used for transforming and preparing; the afternoon was show time.</td>
</tr>
</tbody>
</table>
• Book a day for the White Box Wonder Happening. For the Primary Wonder Project we used the morning to transform our three class rooms, and the afternoon was a dedicated show visited by all the school, in class groups using timed tickets.

• If possible, book a day and a venue for Indigo Box. We used the school hall to work together as a year group. This was a day of brainstorming, designing, making, researching... The whole school year worked together, in groups and as mavericks. If time is tight, an Indigo morning or afternoon could still prove productive.

• Is it feasible that you can arrange a day for ‘wonder visiting’? Matthew worked with Denny Plowman of Nottingham Museums and the School to create a day of wonders: a sequence of explorations and events at a significant venue. The day culminated in a display of the day’s productions in an ancient hall.

• The first Green Box events took place on two days: a day for exploring and making, and two days later, a day for making, showing, and collecting. A cornucopia, perhaps best considered a celebration of wonder and discovery.

• Orange and Yellow boxes benefited from being run together on the same day. Forty-five minutes for each seemed fruitful.

• Red Boxes can occupy all manner of slots, and might fit in with classroom life spontaneously. The essence of red boxing is opening packages and presenting the ‘gift’ inside and sharing. You could book a lesson, an afternoon; red boxes might be opened at random times throughout the day and weeks. Red boxing can continue parallel to all boxes.

• Black Box: the Primary Wonder Black Box was an entire afternoon bonanza! Matthew sequenced a huge set of novelties, activities, and collecting pursuits. For Canada, a ‘redux’ (easy to run, productive, fun, meaningful, inexpensive, and so on) is in progress. It is considerably shorter than the pilot Black Box work, which required considerable (though pleasant) preparation and possibly more work than a teacher might be inclined to consider.

Red Boxes

In Brief

Red boxing activities include: seeking; examining; collecting; showing; discussing; constructing; incorporating; celebrating.

Wonder Workers go out into the world to collect ‘wonder’ and ‘wonders’. Concealing their findings in made or found red boxes, Wonder Workers assemble a display of red gifts in front of their WonderWall.

Red Box seeking continues for as long as is possible or desirable, and the Red Boxes allowed to multiply. Pupils wonder when they might be allowed to look inside the many tempting packages. Everyone is curious...
The first Red Box event! Everyone gathers round. Stories about collecting are swapped, boxes are opened, exhibits are considered and discussed.

Red Boxing continues throughout the Wonder Box Season...

- 

Red Boxing is introduced at the end of the Black Box. It is introduced by a letter attached to the Red Box produced from the Black Box. (Currently, see Quick Start Guide). The following extract gets to the heart of the activity:

*Is it possible to collect wonder and wonders? Inspired, perhaps, by the Wonder Wall, inspired, perhaps, by your wondering and wandering in the weeks to come, can you locate objects and artefacts that connect with wonder and wondering? Can you find and collect wonderful things?*

*Here’s the deal: Go out into the world and seek Wonder!*

*Collect wisely and considerately.*

*Make Red Boxes to hide and protect your items. There are no limits or rules to how you might design a Red Box. You can design a net for a cube or tetrahedron, or wrap your exhibit in red paper.*

*Bring your Red Boxes to this room and assemble a table of Red Boxes near the Wonder Wall.*

*The Red Boxes, including the Red Box to which this letter is attached, are not to be opened until {date} when we will enjoy the next Wonder Event, a new sort of show-and-tell...*

*Expand and support your collecting by keeping a journal or notebook of wonders. Make notes about your encounters with your own or other people’s conceptions of wonder. Ask around. Talk to your families and friends. Look for Wonder wherever you wish. Be a good investigator. Look for clues, connections, and variation. Ask questions: What does it feel like to wonder? How do people experience wonder differently? What is a wonderful thing? What do you wonder about? What have people wondered about in the past? What might the future of wonder be?*
For the Primary Wonder Project, ‘Passports’ were issued. These were red pocket books used by all participants to ‘log’ findings and record thoughts they might have had, conceptions collected from friends and family, questions arising...

Opening presents!

For the Primary Wonder Project, an afternoon was arranged for the Red Box Opening Event. Matthew and Mr Heron prepared work space for examination and appreciation of items. Pupils gathered to open boxes, explore contents, consider and discuss.

Pupils were selected via a ballot to step up to the Wonder Table, select a box at random, and open it in front of everyone. As they opened and explored, the lucky pupil was encouraged to talk aloud about what they were doing and experiencing. The lucky pupil was given a minute to describe and consider where ‘wonder value’ might lie in the contents of the package. This was followed by the person who collected the object identifying themselves and talking about the item. Why had they collected the object? How did they encounter it? Again, time was limited to a minute. Finally, for two or three minutes, all pupils discussed their responses to what they have just experienced. Quirky conversation covered such topics as why the item was selected, why/ how etc. it might be considered wonderful, aspects of seeking wonder, the creation of red boxes from mathematical nets and materials, justifications, new ideas, connections between other items brought to the Wonder Table. The Teacher and Principal Investigator helped facilitate, assisted in connecting, and sought to increase opportunities.

About eight Red Boxes were opened during the first session. At the end of the lesson, Red Boxes and newly revealed curios and accounts were restored artfully to the Wonder Table.

Matthew was inspired by the Object Lessons of Johann Pestalozzi (1746—1827).

On other occasions, boxes were opened at the start of day, or at an unexpected time. Connections and ideas were recorded and frequently cherished. The Wonder Wall and Table again incorporated new materials. New Red Boxes continued to arrive.

Wonder Passports were consulted from time to time, and ideas were ‘brought to table’. Where appropriate, material from the passports were copied out or explored, and new items were in this way brought to the Table and Wall.
For Consideration and Discussion:

1. Prepare ‘lesson plan’ or equivalent to match the time available.
2. Displaying for Wondering – How best to present Red Boxes? Red Boxes and their contents form nucleus of emerging Wonder Table. Set up table in front of Wonder Wall – or other location??
3. Labelling boxes – how will pupils ensure they can identify the boxes they have prepared? Does it matter?
4. Consider how the following wondrous factors might be afforded, sustained, and nourished:
   - Anticipation
   - Curiosity
   - Excitement
   - Meaning

Once Red Boxing is underway, discuss ingenious searching and thinking. How does one look for wonder? Where might we find it? Are there methods helpful for seeking wonder?

Where possible, consider ‘going meta’: What did pupils think about the process of Red Boxing? Was the collecting easy or difficult? How to fit certain things in a box? Can you indeed put wonder in a box? Did any produce photographs, sketches, accounts, and include them in a red box? Were Red Passports helpful?

Orange Box

Orange Box might be considered a Treasure Hunt or a Scavenger Hunt. This was a great success in the Primary Wonder Project. One of its charms might be the thrill of seeking against the clock, in teams. It is also a nice opportunity to see where wonder might be located in the school and environs...

Orange Box took place during school time in an afternoon comprising Red Boxing, Orange Box, and Yellow Box. Pupils worked in groups of up to five, within the school and school grounds. Pupils, after a briefing (safety, boundaries, wise and non-destructive collecting, and time-keeping) went out in teams with orange collecting trays. The quest – to look for and collect items connected to wonder. Pupils realised they could use their Red Wonder Passports to make field notes, observations, sketches. Digital cameras, used regularly by the class for their projects, were distributed and deployed.
Pupils returned to the Classroom at the designated time after being summoned by a hand bell. All collected wonders were deposited and secured. Pupils went for a twenty minute afternoon break. Many continued to seek over break time.

Here are some examples of what was found:

- An oak gall
- Tree bark
- Grasses
- A beetle
- A leaf painted blue
- A bottle top
- A shell
- Seeds

**Suggested Materials:**

- Collecting trays or boxes
- Notebooks or Wonder Passports
- Digital Cameras
- Pens and pencils
- Time-keeping devices
- Bell (optional)

**Data:**

Take photographs of the event to accompany photographs taken as part of search for wonders.

Keep a log of events.

Prepare a reflective account of the Orange Box experience.
Write up observations. What worked? What didn’t? What surprised you? What was learned? What would you do differently? How valuable was this box?

Feedback, to be collected and recorded at end of session, and during, as arises naturally.
Yellow Box

Yellow Box sees pupils working with materials collected in Orange Box. It evokes the tradition of the Nature Table and the Cabinet of Curiosities, and explores sorting, categorising, meaning-making, displaying, communicating, visiting. Helping students create Meaningful Arrays is key, and is a development of Wonder Cell work first carried out as part of Black Box.

Suggested materials:

Large sheets of yellow card stock (A0 is ideal)—one sheet per team

Useful stationery: white index cards, labels, coloured pens

Tools to assist in examination of materials: magnifying glasses,

Tools to assist in creating arrays: brushes, tissue paper.

What Happens?

In brief: Working in the same teams as for Orange Box, pupils create meaningful arrays on their tables from the items they have collected during the Treasure Hunt. Next, teams visit each other’s displays in silence. The ‘carousel’ of visits is repeated – this time the teams host their own arrays, provide docentage, and take questions as part of discussion. To bring things to a close, materials generated during Orange and Yellow Box are incorporated into the Wonder Table, in front of the Wonder Wall.

A Description of the Primary Yellow Event: Teams returned to the classroom after break. Each team table had been set up with a large (A0) sheet of yellow card. Materials (pens, labels etc) were distributed. Teams were given the challenge of sorting, considering, arranging and augmenting their Orange Treasures in such a way that other teams would be able to look at – and, we hoped, admire and learn from– the work. It should be interesting, have something to communicate, and address the theme of wonder and wondering.

Teams were given 15 minutes to prepare their tableaux.

When the time was up, a bell was sounded and everyone stood by their table arrays. Every time the bell sounded, the teams moved round the room to look at the next display. Teams had a short time to view the materials: a maximum of two minutes. Longer time might be considered. Pupils were not permitted to touch or alter the displays. Nor were they allowed to discuss what they were experiencing. Music was played during the viewing – in this case, lute songs of John Dowland.
When the teams had performed the carousel tour and visited each table, they came to rest once again at their own displays.

For the next round, teams played host. Each exhibit was visited in turn. About 5 minutes was allotted per visit. Each visit began with visitor feedback from the previous viewing. What did the teams think about the displays before them? Information? Style? Themes? Inspiration? The team responded to visitor comments, and recounted their thinking behind their displays, and their responses to wonder and wondering.

When each of the displays had been visited and appreciated, as a final phase materials collected and created (e.g. labels) were, where possible and by consensus, added to the emergent Wonder Table.

**Generations:**

At the end of Yellow Box the Wonder Table holds: unopened Red Boxes, opened Red Boxes, the contents of Red Boxes in considered array; materials gathered and made during Orange and Yellow Boxes. Associated with the table is the Wonder Wall, which continues to grow as pupils collect new ideas, sketches, questions...

Orange collecting boxes are stacked, yellow array cards are put in a pile.

**Data:**

Take photographs of the event.

Take photographs of (or have teams photograph) the table displays.

Take before and after photographs of the Wonder Table.

Keep a log of events.

Prepare a reflective account of the Yellow Box experience.

Write up observations. What worked? What didn’t? What surprised you? What was learned? What would you do differently? How valuable was this box?

Feedback, to be collected during and at the end of the box session.

**Green Boxes Follow…. Watch this Space…**

Dr Matthew McFall, 17 March 2010

[Email address]
Fool’s Guide to Wonder Boxes:
Green, Blue, Indigo, White, Glass

Dedication

Hi, John! As ever, I have greatly enjoyed preparing this baggy monster of a guide for you. It was extremely helpful to attempt a ‘Dummy’s Guide’ (of sorts). It needs a rewrite and a recraft in future, guided perchance by your experiences of Black Box, Red Boxes, wonder caving etc…!

Thank you for approaching me – as if by magic! – with offer of game-playing and co-researching. At the time of writing this, all I know is that the red boxes have been amassing in Canada. I benefit from an intense feeling of curiosity… Having seen your wonder wall, and the ideas arising, I reckon there are some brilliant curiosities waiting to be unwrapped. I can’t wait to learn more, and hope you and your class find much benefit, however far you get with the Boxes!

I know for a fact that the Fool’s Guides have been a chimaera, an exploration, but if they have inspired, or assisted wondering in any way, then I am delighted. The process of communicating has itself been very helpful. And much of this experience and these materials go into the cabinet of curiosities that is my dissertation and will further inspire the next wave of wonder guides (with pictures)!

John and Wonder Workers – sending you much appreciation and wishes for much wonder!

Questions

I turn to these questions time and again. Denny Plowman (see Blue Box) says: ‘Better to remember a question than forget an answer.’

✦ How do individuals conceive of and experience wonder and wondering?
✦ How might we research wonder and learning?
✦ How do wonder and learning connect?
✦ How might we generate wonderful learning?
✦ What might be the value of wonder for learning?
✦ How might we seek to evaluate our productions?
Green Box

This module, which ran for two sessions, was an opportunity to:

- Review some of the work done
- Consider the tradition of the Cabinet of Curiosities
- Investigate an existing Cabinet made by Matthew
- Create artefacts for a new Cabinet
- Prepare exhibits/stalls for a proto-Wonder Museum
- Show our Wonder Museum to an unsuspecting invited audience

SESSION ONE:

We began with a discussion of our wonderings so far. We were nostalgic about the Black Box experience, talked about collecting and red boxes, and thought about our recent hunting and assembling. We had the opportunity to open a few new red boxes. Matthew and Mr Heron were pleased to present some of their wonders to the class. Exhibits included a wooden teacup, the seeds of the bird-of-paradise plant, tropical fish. Discussions that arose included the wonder of time; change; computers; colour; origami...

Matthew introduced the idea of the Cabinet of Curiosities. He showed pictures of Cabinets from the catalogues of Imperato, Worm, and Kircher. He talked of the way cabinets of curiosities might have been used: how they stimulated all the senses, how they served as spaces for inspiration, meditation, display, ‘showing off’, exploration. Textures, smells, sounds, surprises would have abounded. Encounters with the rare, the alien, the exotic, the disgusting, the awe-inspiring awaited. Things to question, connections to be made; the potential for insight, understanding, and mysteries both frustrating and liberating. Cabinets of Curiosities: ultimate learning spaces!
Matthew then introduced one of his own portable cabinets: a lucite box with 16 compartments, transparent on one side, opaque on the other. Here are half of the inclusions:

- A phial of colloidal gold
- An encoding device
- A darkling beetle
- A shark tooth
- A glass eye
Pupils were asked to consider the cabinet, and select objects they found most wonderful and most curious. They then produced a piece of work based on what they saw. They were able to return to the cabinet for inspiration. For some, it was an opportunity to sketch and describe, for others the chance to ask questions. Some wrote about what they thought they knew. Others were inspired to conjure up memories or associations...

Pupils were then invited to make their own cabinet. Matthew then produced an identical but empty cabinet box, and a quantity of white modelling clay, a piece no larger than a snooker ball per person. Coloured pens were also freely distributed. Pupils then modelled ‘curiosities’ for inclusion in the
empty cabinet, also creating an accompanying ‘museum index card’, giving the object its name and a brief account of its wondrous connections.

We then had the opportunity to look at our work and discuss our wonders. We visited the tables as we had done before in Yellow Box. Models ranged from Stonehenge to batteries, via nautili, bling, and bowls to hold water. Pupils had brilliant things to say. The new exhibits were then installed in the empty cabinet.

*John! Perchance this is a good opportunity to work with the Ballot cards your team produced as guesses for Black Box? As WonderWorker, could you, in advance of the Box, transcribe and display ballot cards, or even put together an actual physical cabinet based on all guesses, sourcing appropriate objects and artefacts, to unveil and present to the class?? Or perhaps you could all collaborate, revisiting the cards and guesses, with all wonder workers having the option of modifying or ‘upgrading’ their choice of exhibit of wonder. Discuss and celebrate choices. Then set about sourcing items for your emerging Cabinet of Curiosities. As head teacher extraordinaire Simon Cooper-Hind likes to say: ‘Make it real!’ :)*

**SESSION TWO**

We returned to the theme of curiosity, and the museum, and the spectacular. We considered other traditions of wonder happening: the sideshow, the peepshow, the show. We then discussed how we as a class might prepare wonders for an invited audience— in this case, the two other classes in the year group. Pupils considered what they had learnt so far about arranging and presenting. We looked at what we had already constructed as part of the Wonder Wall. We looked at our exhibits on the Wonder Table. In cleverly selected teams, we shared visions of what we might show and do. The class then checked that we represented a diverse selection of wonderful categories (we did!). We then learnt that we had two hours to prepare for our first guests... The energy was phenomenal. Pupils set about making, transcribing, preparing and transforming.

Exhibits decided on ranged from origami, fossils, nests, games of chance... and guessing the contents of a box. One table collected from visitors their own thoughts about wonder, and their thoughts about the event. One team was responsible for meeting and greeting.

Visitors arrived in two shifts. Within seconds, the wonder team learnt the importance of event management and, in particular, flow. The bottle-neck that formed at the first stall was dispersed by
‘stewards’ encouraging visitors to visit other offerings. By the second visit, the wonder workers were adept and gracious hosts.

There was much excitement, laughter, surprise. All the signs and aspects of wonder and wondering one might hope for. Interactive events were a great hit. New information was treasured. One team were hooked by the idea of there being (many) more than five – or six – senses. They seized the idea of proprioception and shared it with every visitor. Other tables hosted imaginative drawing competitions.

Pupils interacted with interest, energetic curiosity, and seriousness. Amongst other things! There was plenty of evidence of what we might call ‘learning’ (q.v.). And it appears to have been memorable stuff. Pupils talked about what they had learnt when I visited the school the next year, ranging from ‘how to display things so people will look’ to ‘African slave money was made in Bristol’. Teaching and coaching were the preferred interaction of a number of wonder workers: pupils set up stations where they showed materials, with commentary, and asked questions of the participants; others guided pupils in designing and copying exercises.

Productions:

With Green Box, work expanded beyond the Wonder Wall and Table. The two Cabinets were now proudly put on display by the pupils. The models, tickets, posters, origami folds, suggestion boxes, information sheets we made spilled out around the class.

Photographs of models, displays etc were taken. Matthew and Mr Heron prepared reflective reports.

Participants (John: are you still reading?!): feel free to do the same. Take photographs of the work as it emerges. Treat models, index cards, blueprints as resource for continued work (clews for White Cube).

Do the usual: prepare a report on the experience. What happened? What worked? What didn’t work? Any surprises? What was learnt? What was valuable? What would you do differently...?

Blue Box

The idea of ‘wonder visiting’, wandering, and wondering are at the heart of the Blue Box.

Wonder visiting ought to work anywhere. It seems preferable and ingenious that a local site is chosen – minimising travel and developing local appreciation. But there need not be constraints. I
also wonder whether schools might encourage ‘weekend wonder visiting’, providing sufficient materials and ideas for families and friends to wonder together. I am due to start work on a collaborative project which explores this idea of wonder touring. I’d wager any destination will yield its wonders, if we have meaningful pursuit and are able to both pay attention, play, and create. Open parkland, a market square, a preserved building, a geological feature...

Every wonder visit will be different. However, we might consider key aspects for a day of wonder visiting:

- Structure: a day of pursuits, with breaks, and a grand finale.
- Wondering and wandering facilitated
- Observation
- Documentation
- Construction
- Opportunities for display, sharing
- Events informed by aspects of wonder: curious, intriguing, unexpected, meaningful, positive.

Practicalities: for the Primary Project, the event was for 80 wonderers: pupils, teachers, teaching assistants. I worked with what was practical and available— and here I was very fortunate to have a site of many wonders nearby, and a treasured contact at Nottingham Museums, Denny Plowman, who is something of a thaumaturge. I had my eye on a wondrous and ideal local venue: Wollaton Hall and grounds. I’ll tell you a bit about the place, so you can see why I thought it a marvellous venue. The Hall, built between 1580 and 1588 for Sir Francis Willoughby (1547-1596) was once the tallest private residence in the land and holds an awesome Prospect Room, the floors of which are constructed from puzzling and intricate wooden latticework. Francis Willughby (1635-1672), descendent of Sir Francis Willoughby (1547-1596), produced significant works on the taxonomy of birds, fish, and insects. He also wrote an astonishing study and compendium of games and sports. How wonderful is that? The Hall now houses Nottingham’s Natural History collection: highlights include a huge collection of Blaschka glass models of sea creatures, a stuffed giraffe, taxidermic tableaux, and a glassy cabinet of curiosities. The Hall also boasts an ancient clock with one hand, carvings and balconies inside and out, a mineral collection, a well. What’s not to wonder at? I should also mention the grounds with a realm of woodlands, lake, glass house, statuary, and tunnels. And a technology museum with machines, vehicles, and a steam-powered replica funfair...

For the Blue Box I prepared a day’s schedule based on meaningful pursuits across the Hall and grounds (this required a couple of visits and some pretty elaborate game design). I am convinced
that something equally wonderful can be produced with an even simpler modus operandi. My best design choice was this: ‘avoid dominoes’. This was a note to self to avoid situations where a delay could cause serious damage. By allowing for transition time, and scheduling pursuits in blocks, the day ran smoothly, in spite of the trickeries of Chronos!

On the day of the wondering, I arrived early at the site and awaited the arrival of participants. My design plan to ‘avoid dominoes’ paid off straight away: the coach was delayed by an hour. Fortunately my timetabling meant we started the game from the second pursuit. I divided pupils, teachers, and teaching assistants into 5 teams, each team with a name of local significance and redolence. Teams would ‘rotate’ pursuits throughout the day. Thus at any one time, one team would be exploring the grounds for flora and fauna, another examining architecture, another producing commemorative art, another designing machines, and another on a guided tour of the Hall. The tours of the Hall, 45 minutes front and back stage at the Hall, were given by Denny Plowman, and were dreamt up to showcase wonders and curiosities of the collection, to deliver unexpected and benevolent experiences and information. We had a lot of fun putting this together. I had Denny carrying a mysterious locked box, a key, and a bell. Towards the end of the tour, pupils sat in a drawing room and sketched out or wrote about the wonders they had seen. Magic.

If at any time during the day pupils came up with questions (or ‘wonders’) these were written down on index cards and collected in by Team Leaders.

At the end of the day we gathered in the main hall to display the reports and artworks we had made in our groups. There was another visiting/proto-museum experience, with pupils looking at one another’s work.

This was followed by a Q&A finale: a Wondering. We were joined by renegade ‘experts’ who had the pleasure of answering questions or surrendering to mystery. Questions that pupils had written down on cards were read out; answers were provided if possible. At times we were content to live in wonder!

A simple ‘information sheet’ about wonder was prepared for the day, as were worksheets. The information sheet is appended.

The art works, reports, maps, designs, sketches produced on the day were returned to the school. These were treated as yet another resource for our wonder work.

Suggestions:
Prepare a reflective report, incorporating notes made during the day. See end of Green Box for suggested questions.

**Indigo**

Indigo Box was a day of making, researching, and preparing for our season finale: White Cube. The entire year group, who had all been part of Blue Box, assembled in the school Hall with teachers and teaching assistants. We had a brief recap of the field visit, a discussion about wonder and wondering, an enlivening show-and-tell. I showed a couple of wonders: a strange ringing bell and a growing head illusion.

We then proceeded to make a new resource for inspiration: The Wonder Horse. Pupils, teachers, and assistants were provided with post-it notes and pens. They were then asked to write down or draw examples of things that might make them wonder or feel wonder. When ready, pupils attached their ideas to a vaulting horse. This resource of wonders served as inspiration for the next stage.

Pupils formed teams of 2-5 based on their interests/wonders. Teams were formed as pupils roamed freely around the Wonder Horse and announced their interests. Everyone seemed cooperative and intrigued and the groups formed remarkably quickly. There was a mix of ‘friendship groups’ and novel teams (magicians, for example, and fossil buffs were united across classes). Wisdom of teachers and assistants kept the selection process lively but controlled.

At the beginning we had 17 groups. The dynamics of some of them switched as the day proceeded. One chap decided he wanted to go it alone as a magician, and prepared a list of the tricks he could do and the materials he needed. Groups dedicated to Space and the wonders of the universe formed new clusters. A teacher told one group that they could not do Wonder of Bees because another group were doing Wasps. I tried to say yes to everything.

Materials provided included card, paper (indigo, for morning prototyping), pens, paints, more paper, tape, a hole punch.

For the rest of the morning slot, pupils worked in groups. They used indigo paper for brainstorming, designing, preparing etc. for the afternoon making session. I cannot believe how much paper they used. Brilliant! Excellent ideas were generated.

In the afternoon, groups prepared information sheets, banners, tickets – anything they needed for the White Cube.
Pupils were allowed access to the Library and the Computer Suite – both being situated off the Hall. Pupils chose to bring library books back to the Hall to work from; time was used productively on the Internet – puzzles and optical illusions were sourced. One group prepared a PowerPoint show on fossils; another on the solar system.

We worked with considerable energy. It remains a thrill to contemplate!

The last 15 minutes were devoted to discussion:

What we needed to do next. We had only a week till the Show. There would be one more making session later in the week; otherwise pupils needed to work as teams and find and make etc. as homework. No one complained.

Pupils made requests. One girl wondered if anyone could supply her with cardboard boxes for her exhibit; a boy asked if anyone had any strange fruit in their fruit bowl.

Materials were tidied. Creations were taken back to classrooms. The Wonder Table and WonderWall were eclipsed!

Suggestions:

Take photographs of the works-in-progress, the Wonder Horse, the productivity...

Keep a record of events during the day.

Consider how, for example, researching, creating, communicating might be supported.

How might learning, meaning, wonder, and wondering be encouraged and fostered throughout the day?

White Box

A Day of Wonder

After registration, classes assembled the materials created during – and since – Indigo Box. We had a lot to show – and a morning to prepare. Our first guests would arrive at 1pm, and from then the afternoon would proceed like a clockwork mechanism, circulating visiting classes from one wonder room to another.

Pupils, teachers, teaching assistants, staff, and Matthew set about transforming the three classrooms into what the pupils called ‘showrooms’. We were pretty advanced creators by this stage. The experience of Green Box remained much in the minds of both stall holders and visitors. It
meant that we had a good idea of – and confidence about – welcoming, showing, communicating, and that was reflected in the speed, efficiency, and serendipity with which we worked.

Pupils came up with an impressive cornucopia. There were stalls devoted to fruits, optical illusions, the senses, colour, growth and hormones, music. Stallholders offered games (feely boxes; pea counting), competitions (puzzle-solving; designing); experiences (tasting strange foods; watching conjuring demonstrations) and tokens (collectable stickers, badges). Information was bountiful. Stalls offered up items for examination, information to read, and often both. The range of novelties, surprising facts, questions, mysteries, and jokes was enlivening. Even the refreshments were unearthly.

The ingenious timed ticket system was drawn up by the teachers. This was in itself a supreme act of wonder. It meant that every class in the school, from Foundation to Year 4, got to see every showroom in turn. Because Years 5&6 were running the Show, the next morning was devoted to them being able to visit each other’s wonder caves.

The Wonder Showrooms were nothing less than wonderful. There was much laughter and surprise, plenty of Wows, much pride and delight, and many expressions of inspiration. One teacher told me how she now knew how to reach one of her more withdrawn pupils – she had seen him come alive amongst the fossils and minerals! Stallholders talked about the things they had learnt: how to welcome people, how to communicate with different age groups, how to produce appealing materials, the new things they had learnt. One girl discovered that the youngest visitors did not know the colours of the rainbow in order, and set about changing this with determination and a lot of coloured pens.

Pupils took a number of opportunities to collect from visitors their feedback and thoughts. One table canvassed for ‘Wonders’, another for favourite curios.

When I last emailed the school, pupils were considering another wonder event, drawing on the materials generated by the Wonder Boxes.

Suggestions:

Be a good facilitator and observer! Keep a journal. Consider quality of learning, meaningfulness of events, and support of pupils in all activities.
Produce a report, as per the other boxes. Incorporate photographs and artefacts.

Invite ‘guest wonderers’ and have them prepare an expert report on their experience of the happening. Different assessments provide fertile ideas and guidance.

**Glass Box**

After the Primary Wonder Project, the school set up a virtual Wonder Room, a forum accessible to all pupils to reflect on and examine the experiences of the Wonder Box system. It seems great wisdom to set up a secure evolving space in which, primarily, wondrous experiences, from Black Box to White Box, and new projects emerging, can be stored and celebrated, and where wondering can continue. I have the honour of being a moderator, and I log in irregularly (in the interests of wondering). It has been a treat to keep in touch.

Pupils have posted memories of different box experiences. They have shared new wonders, set up challenges, played guessing games, asked questions. The space might be considered a cabinet of curiosities.

This resource, or storehouse, can be used for inspiration and guidance for future wonder work.

Suggestions:

Set up your own digital Wonder Room. Upload class work, photographs, souvenirs, accounts. Have space to swap memories, questions, ideas...

**Valediction**

By working with materials such as these, observing and recording events, striving to work creatively, empirically, and diligently, you are contributing to the grand tradition of Wonder Working!

As the Wonder Boxes are ‘opened’ and explored, keep process notes. What worked? What didn’t work? Any surprises? Any innovations? Where possible, find out what your fellow wonderers (pupils, teachers, assistants, staff, guest stars) might think. What did they enjoy? What did they learn? How would they do things differently?

Collect, catalogue, record, share. And let me know what happened!

For now, and certainly till the end of 2010, this is me:

*ttxmsm@nottingham.ac.uk*
I am seeking ways of pooling of wondrous knowledge and wondrous materials, both digitally and via clever analogue routes... Watch this space! And keep in touch!

**Extra Materials**

I am preparing two five-minute films: Working with Wonder 1 and 2: ‘Wonder’s Heritage’ and ‘Wonder Boxes’.

In the meantime, there are 2 brief presentations posted on the Internet, freely available, which *might* inspire:

- ‘Introducing Wonder’, (c.15 minutes) a rapid-fire swoop across wonder’s realm.  
  Learning Sciences Research Institute, February 29, 2008.  
  [www.lsri.nottingham.ac.uk/phdtalks/matthew.pdf](http://www.lsri.nottingham.ac.uk/phdtalks/matthew.pdf)

- ‘Working with Wonder for Wonderful Learning: Boxes of Learning Delight and Cabinets of Curiosities’ (c.30 minutes) ALT-C Conference, Manchester, September 2009.  

Both are live recordings, warts and all, but they have their charms! The latter has a section devoted to Primary Wonder Boxes. I can hardly bring myself to watch it. But it is at least from the heart...! (: 