Mapping digital makers
a review exploring everyday creativity, learning lives and the digital

A STATE OF THE ART REVIEW written for Nominet Trust by Julian Sefton-Green
Foreword

Digital making is the creative process of making a product or digital artefact. Digital making can mean coding and using programming skills, but also other creative uses of digital tools to make new products. Digital making skills are fundamentally underpinned by an understanding of computational thinking but may also include things like creative teamwork, problem solving, engineering and design in order to build new technologies.

Underpinning our Digital Makers work is a recognition that the process of making supports an understanding of how digital technologies are created, which can lead to more informed, critical uses of digital technologies and systems.

Whether motivated by future economic need; support for personal creativity or a recognition of the role of digital technology in fostering new forms of social participation, there is a growing acknowledgment of the importance of supporting young people in such informed uses of digital technologies. However shared this ambition though, these different motivations; the role of digital technology for learning and the place of making and creativity in education all come with different (often competing) traditions and educational practices. As such, understanding how we best support young people as digital makers is a complex challenge and one which requires careful consideration – something this report sets out to do.

As we continue to work with partners such as Nesta and Mozilla to support a generation of digital makers, I look forward to your comments and hope we can work together to address the issues set out in this document.

Dan Sutch
Head of Development Research
Nominet Trust - March 2013
About the series

Nominet Trust State of the Art Reviews are undertaken by leading academics to collate and analyse the latest research at the intersection of digital technology and society. Drawing on national and international work, these reviews aim to share the latest research to inform the work of the Trust, those applying to the Trust and our wider partner organisations.

We value your comments and suggestions for how to act on the recommendations in these Reviews, and how we can build the series, so that it is more useful to us all as we explore how digital technology can be used to design radically new solutions to address specific social problems.

We look forward to your comments and suggestions at:

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Executive Summary

This review maps the theory, practices and policies that underpin our understanding of digital makers and digital making in relation to young people. It investigates the relationship between what young people do today with digital technologies and what they then might do as adults and when in the workforce. In particular it explores how more nebulous out-of-school creative pursuits might mesh with formal instruction and how this might lead to future ambitions. It sets out to answer questions around three key themes:

1. **Learning and the economy**
   a. In what ways does ‘digital making’ affect opportunities for employment, economic growth, and the changing nature of work and the workplace?
   b. In what ways do qualifications and accredited training routes build on and offer progression with in- and semi-formal learning experiences (in relationship to digital making)?
   c. What might be changing about work and work places that could build on (and develop) digital making experiences?

2. **The individual and learning**
   a. How does digital making develop and support personal efficacy and expertise?
   b. How and why might it be important for self-expression and other kinds of personal development?
   c. In what ways does it support and develop other kinds of learning?
3. Learning, community and society

a. In what ways does digital making support or enhance forms of civic and wider social participation?

b. And conversely, how do forms of mediated sociality contribute to digital making?

The introduction explores the three key concepts that underpin analysis: children, youth and the idea of age and life-course; definitions of makers, making and creativity; and what difference does the digital make. This leads to three types of secondary concerns:

1. Whether conventional institutional boundaries around age serve to hinder or help digital makers or making, and how the processes of learning to be a digital maker relate to salient experiences across different parts of the life-course.

2. How we can integrate older notions of craft and making within the more open and inclusive models of participatory culture now on offer, and also how everyday and popular ideas about creativity can or cannot be reconciled with more exclusive principles of innovation and growth.

3. How we can define the distinctiveness of the digital as a medium, but also how the making practices from other production domains can be related to and develop further the digital making process.

Whilst this review offers a curated analysis of the literature, policy and accounts of practice that both describe and conceptualise digital making, there are very few accounts of the field in general. There are, however, a wide range of more narrowly focused individual studies, and some of our interest in digital making can be inferred from larger quantitative data sets. It argues that this isn’t a well-established field of study and a final underlying aim of this review is to offer some kind of discipline to support appraisal of what works and what doesn’t. The main challenge facing a
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It also suggests that we also don’t know a great deal about what triggers participation, and especially why some young people might drop out of such trajectories and some continue in digital making activities.

Chapter 2 focuses on creative and making experiences undertaken by young people mainly by themselves or with their friends and sometimes in the context of production-focused communities. It first examines more qualitative studies of makers and making, and then offers a snapshot of how many people might be engaged in creative making activities and what we might know about them in statistical terms.

It suggests that we have a general common sense about how people get engaged in creative digital activities and some insight into the patterns of their progression and development, focussing on the collaborative, social dimension of creative communities. It also suggests that we also don’t know a great deal about what triggers participation, and especially why some young people might drop out of such trajectories and some continue. Whilst all the research reviewed in this chapter is clear about the development of technical competencies and skills, it is notable that these concerns don’t figure highly in accounts as being the most crucial barriers to development. Above all, it seems as if we don’t have much evidence following learning across sites and within communities with any but the most superficial idea of how to describe progression in creative making. Whilst most of our understanding of making is retrospective, this will remain a gap in the knowledge base.

We do know that only a very small proportion of young people are involved in sustained and developed creative activities. We don’t know enough about who these young people are (in social terms) and we also don’t know enough about the interrelationship of at home, informal and formal educational drivers. Situating young people in creative communities would seem a sensible way to understand how individuals do and do not progress. Finally it would be useful to know much more about the interrelationship of different knowledge domains – how, for example, skills in music or writing interrelate with using, publishing and sharing products.
Chapter 3 is concerned with the range of interventions on offer across the full spectrum of educational provision that support and develop digital making. Whilst it is probably fair to say that many of the initiatives described here have not been fully compared or evaluated, the chapter addresses informal learning (by one’s self), more organised initiatives in non-formal settings, and the formal curriculum. The analysis concentrates on what research can tell us about the impact of these initiatives, and secondly on the model of learning presumed to underpin engagement and understanding.

It unpicks the different and at times contrasting theories of learning at work in informal, community-based and non-formal sites of learning. In turn these too are contrasted with some of the key principles underpinning syllabi in the broadly defined digital creativity curriculum areas at school. It notes there is a dearth of literature exploring the transfers across and between these different sites of learning, and a host of suspicion and assumptions about these domains from the perspective of the other.

It suggests that there is a need for more systematic evaluations of learning within a range of the new sites for digital creativity that are emerging today. It argues that there is a need for an overarching set of principles about digital creativity, which can find a way of picking its way between the different purposes of teaching, learning and pedagogy, as well as reflecting on the digital worlds which young people inhabit today.

Chapter 4 focuses on more formal policy documents and public pronouncements around digital creativity. The chapter first looks at policies around the creative and cultural industries, and secondly broader ideas about digital citizenship and digital literacy, before examining vocational training and the role of industries in qualifications for digital creativity.

It concludes by suggesting that policy interest in the field of digital creativity is dispersed and fragmented. It is segmented within and between different levels of the
The continuation of discipline-specific traditions of learning and ways of working seems to militate against the convergent and integrated nature of digital making.

There is an absence in the policy rhetoric of ways to devise and develop productive ways of connecting different formal and informal learning domains. The creative elements of participating in digital culture – which are central for many young people and which may well be important in the wider political discussion about forms of social participation – do not seem to have found their way into formulations about core digital competencies.

The conclusion reviews the evidence deployed in the report, arguing that the nature of the evidence base across these fragmented fields of study is uneven. There are a quantity of accounts of developments in practice, especially of innovative technology and teaching, but there are very few systematic studies either of individuals or of cohorts, and there are very few accounts of progression. There is very little understanding of what might be thought of as transfers of understanding and activity across domains, art forms and academic disciplines. Research tends to cluster around an interest in the expressive and civic dimensions of participating in digital cultures, and seems to point fairly urgently towards a significant gap between the possibilities
afforded by the technology and actual day-to-day usage. However, there seems to be little research into the motivations, barriers and achievements of those actually working in the broad spectrum of digital creativity industries.

Final recommendations suggest that research and knowledge sharing needs to be developed in three areas:

1. Exploring, anatomising, and re-conceptualising digital creativity, making or digital literacy or some new term bridging these ideas as an integrated concept across, as part of and as discrete from other creative production disciplines. Such a concept needs to be able to be operationalised in policy, curriculum development and teacher education.

2. Modelling growth, developments and progression in creative people (or people engaged in making and devising) as they move across and between different life-course experiences in respect of participation in digital creativity, including their developments at different stages of the education system and into employment. Such modelling needs to focus particularly on the catalysts and disconnects that enable or hinder individuals to continue to develop.

3. Investing in and sharing systematic accounts of learning digital creativity in a range of educational locations (at home, in the community, at school, college, university and at work), including case studies and quantitative measures in order develop a more consistent evidence base to support on-going initiatives.
1. Introduction

This review aims to map the theory, practices and policies that underpin our understanding of digital makers and digital making in relationship to young people. However, each of our key terms, ‘digital’, ‘makers’ and ‘young people’ are in themselves complicated and become more so in relationship to each other.
Two current interests motivate the review. First of all, there is considerable attention to the role, use and meaning of digital technologies in young people’s lives. This covers the full age spectrum and includes concern with the changing nature of family life, implications for changes in the organisation of schools and other kinds of educational provision, as well as peer and social interactions. As we will see, some of the focus here is anxious with an implied argument that as digital technologies take up more and more of young people’s leisure time; mediate a very wide range of their personal and social relationships, as well as becoming dominant in many kinds of learning, so it is impossible to separate the fabric of modern childhood and youth from participation in digital cultures. At the same time there is an important counter-narrative that describes the possibilities for a new kind of educational settlement with self-motivated, personally organised learning made possible by digital technology.

The second interest in digital making stems from widespread economic changes. Digital technology, in all its manifestations, is central to many kinds of production and growth. Future economic prosperity will depend on a workforce that is inventive, imaginative and above all fluent in digital skills. Whilst the first interest is oriented towards the past and present examining how childhood, youth and the activities of the young are changing, this second focus is future-oriented. It is aimed at ensuring at national level (although the focus of this review is the UK, we can see the same concern expressed by many countries around the world) that young people are prepared and interested in developing opportunities for making and developing the technologies of the future.

1.1 Key questions

The relationship between what young people do today with digital technologies and what they then might do when in the workforce is therefore a crucial part of our argument. In particular, the key terrain of the review is in teasing out how more nebulous out-of-school creative pursuits might mesh with formal instruction and how this might lead to future ambitions.
This interest can be thus broken down into three sets of questions, which will structure the argument in the following chapters.

1. Learning and the economy
   a. In what ways does ‘digital making’ affect opportunities for employment, economic growth, and the changing nature of work and the workplace?
   b. In what ways do qualifications, and accredited training routes build on and offer progression with in- and semi-formal learning experiences (in relationship to digital making)?
   c. What might be changing about work and workplaces that might build on (and develop) digital making experiences?

2. The individual and learning
   a. How does digital making develop and support personal efficacy and expertise?
   b. How and why might it be important for self-expression and other kinds of personal development?
   c. In what ways does it support and develop other kinds of learning?

3. Learning, community and society
   a. In what ways does digital making support or enhance forms of civic and wider social participation?
   b. And conversely, how do forms of mediated sociality contribute to digital making?
However, before we can begin to answer these questions – or at least describe if (or how) others might have addressed them in the literature – we need to tease out our key terms in more detail.

1.2 Children and youth – age and the life-course

Typically a review like this about aspects of learning and young people will consider customary age boundaries at different stages of the education system (pre-school, primary, secondary, tertiary). In general, we tend to think about children and young people either in developmentalist terms (that is, according to norms of ages and stages) or in relation to the way that our society provides for them (especially how we ‘cut up’ their growth in terms of different kinds of educational provision). However, in a number of ways, the digital era challenges these assumptions and forces us to struggle with conventional definitions.

Access to digital technologies in the home has undermined many institutional definitions of age. First, we know that even quite young children can attain considerable independence in their uses of digital technology. This allows them the authority and autonomy to behave and interact in ways that we might not expect. Life online, especially that facilitated by more anonymous kinds of virtual communication, appears to enable young people to act more as equals and less as positioned by societies’ expectations of them as in some ways less capable and more needy. At the same time, some of the social barriers that existed separating a child’s life from an adult’s have become considerably more blurred, and it is much more difficult to draw boundaries around interests and habits marking and separating the younger from the older. Concerns with what is age-appropriate and how to regulate and control access to material in the home are often public signs of these deep-rooted social changes.

Finally, there is the question of how or where we might define the end of childhood and youth. The idea of ‘tweens’ now implies a more complicated transition between child and adolescent. At the same time conventional assumptions about the transition
Many initiatives to develop opportunities and skills in digital making are either offered directly to the young person – and thus possibly bypassing both parents and the school – or, paradoxically, organised and offered according to age-limited institutional definitions. Programmes and activities are aimed at children and young people of primary age or post-statutory experience (both in and out of school or other kinds of training).

Clarifying questions for us to explore then are:

- whether conventional institutional boundaries serve to hinder or help digital makers or making,
- and how the processes of learning to be a digital maker relate to salient experiences across different parts of the life-course.

1.2.1 What do we mean by ‘makers’, ‘making’ and ‘creativity’?

There are a host of pitfalls hidden in the formulation ‘digital makers’. The next section will deal more specifically with the digital dimension: here we need to disentangle assumptions and trends bound up in the idea of making and creativity. This nexus of ideas is further confused by the ways in which we are interested in both finished products and the processes of learning. Given our focus on how people become digital makers, we obviously need to be broadminded as we examine the gradient of travel, rather than only pay attention to the completed goal.

The role of play and playfulness is crucial to creativity in the digital era. This includes both an experimental, trial and error way of learning as well as an insight into the
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The game-like (and often explicitly game-ful) nature of many digital products and modes of participation. The centrality of play in many theories of learning, and of course especially as a way of understanding younger children’s engagement in the world, makes this mode of being seem particularly important in understanding making in the digital era.

In recent years the older idea of making as ‘craft’ has become conflated with ideas about everyday creativity and participatory culture. All three concepts (craft, everyday creativity and participatory culture) embody different theories of learning and inflect the value of process to product in different ways.

Craft and craftsmanship imply a set of values where the authenticity of the maker, the traditions of the making process (the artisan and the atelier) and above all the skilfulness of the maker expressed as an aesthetic quality is an integral part of the finished product (Sennett, 2008). In some ways the infinitely reproducible nature of digital culture might seem at odds with the handmade individualised values implicit in the idea of apprenticeship, and this trope – of refining skills through experience, learning through repeated practice – is often taken to represent a pre-digital mode of production. This possibly false opposition is only strengthened by the idea that manipulating digital tools is intuitive, easily picked up and open to all. However finding ways to recuperate craft in the digital era (possibly with the modes of learning it embodies) is an interesting challenge and is pursued in the next chapter.

A feature of the current era is a belief in the more inclusive and open processes of making culture through participation. Theories of the active audience suggest that what was once thought of as passive consumption now needs to be re-conceptualised as learned and driven by agency. There is a huge interest in all forms of active participation suggesting a ‘continuum of engagement’ – covering diverse activities from game-playing to blogging, to scrap-booking, to simply participating in identity work on social networking sites, and to all kinds of creative fan-based activity. These ideas of everyday creativity and participatory culture begin with a model of low-level engagement in popular culture, and suggest that the processes of learning through
The relationship between participation and production can thus become blurred as people can take on different roles within these various communities of practice – at times leading to income generating or socially productive kinds of activity. This theme is explored in more detail in Chapter 2.

Although from an economic point of view, creativity is often defined in terms of the ability to make something new (and in particular to generate value through intellectual property), we are also living at a time that values a more demotic kind of creativity. Developing a questioning, active and engaged citizenry is necessary to fully exploit and take advantage of the kinds of community and activities made possible by digital technologies. Developing creative consumers is thus an important part of the ecology necessary for the production of digital makers. This theme is developed in Section 3.3.3.

Clarifying questions must thus be:

- how we can integrate older notions of craft and making within the more open and inclusive models of participatory culture now on offer,
- and also, how everyday and popular ideas about creativity can or cannot be reconciled with more exclusive principles of innovation and growth.

Whether these two poles imply separate, new or synthetic theories of learning is also germane to our enquiry.

1.2.2 What difference does the digital make?

Of course people have always made things and engaged in creative activities. There are four dimensions to the digital that might make making different in the current era.

The first of these relates to the digital medium – that is to say imagining, designing, developing or building and then sharing products that are digital in nature: this
The idea of ‘composition’ (from writing and music), of ‘editing’ (from film, photography and writing) and especially the idea of being a ‘producer’ and ‘author’ both capture generic principles of making without losing sight of their rootedness in specific practices and forms.
writing) and especially the idea of being a ‘producer’ and ‘author’ both capture generic principles of making without losing sight of their rootedness in specific practices and forms. ‘Coding’ tends to be used in relationship to the discrete practice of writing computer code, but of course it too can express a translation of idea into a particular symbolic language and thus can imply greater generalisability. Section 3.2.2 suggests that ‘hacking’ might well be added to this repertoire.

Clarifying questions here thus revolve around:

- how we can define the distinctiveness of the digital as a medium, but also,
- how the making practices from other production domains can be related to and develop further the digital making process.

Understanding how and why latent abilities and interests become actualised in the digital making process is also part of this enquiry.

1.3 THE EVIDENCE

Basically, this review offers a curated analysis of the literature, policy and accounts of practice that both describe and conceptualise digital making. There are very few accounts of the field in general. One aspiration for this work and the initiative that supports it is to help advocate and thus cement the place of digital making more securely. There are, however, a wide range of more narrowly focused individual studies. Some of our interest in digital making can be inferred or extrapolated from larger quantitative data sets. These tend to describe the whole gamut of at-home, leisure-based uses of technology and, as we will see in Chapter 2, tend to lump together a whole range of diverse creative activities. Studies of digital making at all levels of the education system tend to be small scale and exemplary. This is a field that generates passion and enthusiasm, and studies frequently report these as innovation or best practice.

Studies of digital making at all levels of the education system tend to be small scale and exemplary. This is a field that generates passion and enthusiasm, and studies frequently report these as innovation or best practice.

See Potter (2012) for the idea of curating or curatorship to be added to this expanding repertoire.
In other words, this isn’t a secure and well-established field of study, and an underlying aim of this review is to offer some kind of discipline to support appraisal of what works and what doesn’t, what is provided and what isn’t. The main challenge facing a disinterested appraisal of work in this field is the tendency to recount exceptional cases rather than to research what we might think of as the ‘ordinary’. This ‘exceptionalist’ frame therefore begs questions about scaling and mainstreaming individual and often well-resourced projects. I would suggest that resourcing is a question of motivated and knowledgeable staff more than equipment these days, given the relatively healthy availability of equipment available to children and young people. Developing sensible and fair recommendations on the basis of this kind of evidence is often difficult.

As part of a way of helping define the field the conclusion will point towards areas where we know very little about digital making and its place in young people’s lives.

1.4 Outline of the review

As this is a review of what is known about this field at present the status of the data available will to an extent structure the argument. The approach taken in each of the three main sections that follow will first be to offer a general review of the literature in that field, and then to investigate what we know using the key questions outlined in this introduction – modified by the concerns or clarifying questions which emerged from an examination of our key concepts.

The next chapter explores digital making as it has been described and conceptualised in studies of ‘the everyday’. This includes an attention to informal, out-of-school learning as well as a focus on peer and network-based communities. The aim in this chapter is to examine accounts of individuals, and in some cases clusters of people and their communities, in order to examine: their making habits; the individual trajectories which expose personal and family histories; and above all the meanings and motivations that inspire and generate digital making activities. An important focus here is on...
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exploring how participating in digital making affects people’s routes into further and higher education as well as into employment.

Chapter 3 reviews projects, programmes and initiatives that exist to develop a range of digital making skills and activities. The focus here is on how curricula have been imagined and developed, as well as on what particular pedagogies have been employed to support and develop progress. What kinds of teaching and what features of learning are important to digital making? What theories of learning structure these interventions and what do such theories imply? The chapter includes studies from within schools, but also from a range of initiatives taking place in after-school and community-based settings. These latter two have frequently been the source for many innovative developments in this field.

Chapter 4 explores how kinds of digital making have been imagined, aspired to and/or inhibited in more formal policy and political discourse. The aim here is to see how public desire to develop digital making has been imagined and enabled. This kind of perspective helps us develop a sense of norms as well as looking at how regulations can support or hinder developments.

In all three of these chapters I will take an international perspective, as not only is this field a matter of global concern but also it is of interest to compare and contrast international developments. The review is not exhaustive but will aim to give some sense how representative certain kinds of initiatives or reports are.

The final chapter will return to the questions with which we started, offering a summary of how the literature is able or unable to answer these questions. It will therefore conclude with suggestions for further and continuing work.
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hobbies, interests and enthusiasms (efficacy, expertise and engagement)

This chapter focuses on creative and making experiences undertaken by young people, mainly by themselves or with their friends, and sometimes in the context of production focused communities. In that sense, young people in this chapter are usually self-motivated – although as we shall see this is often supported quite explicitly in the home – and this chapter explores how people take up and further their interests.
Most of the evidence researches young people who already display a considerable amount of agency, and is focused on finding out what young people do outside of conventional educational experiences: in the home and with friends. This kind of research tends, therefore, to reconstruct learning as it has been rationalised and utilised by the individuals themselves. Although, as we shall see, the young people themselves obviously draw on wide repertoires of learning and experience, we are interested here in how they direct their interests as a contemporary kind of autodidacticism.

The chapter is organised in two main sections. In the first part we examine more qualitative studies of makers and making, and then we offer a snapshot of how many people might be engaged in creative making activities, and what we might know about them in statistical terms.

### 2.1 Characterising the learning-journey of makers

The approach taken here has been influenced by two book-length studies. The first led by Mimi Ito along with a large team of researchers (Ito et al., 2010), draws on a more American vocabulary in its title – ‘Hanging out, messing around and geeking out’ – but captures a model of learning progression in the informal domain. The book contains a range of studies of young people’s active, and at times creative, uses of digital technologies. These have been studied from a broad-based ethnographic perspective – meaning that researchers have found and then interviewed or observed young people and their interactions. It is of course possible to conduct this research process virtually, that is, interacting with young people online. The use of virtual ethnography is not without its problems (Hine, 2000) but it does enable a different way of finding out and understanding digital creativity.

The study by Mimi Ito suggests a kind of recursive participation by some young people in more engaged and involved making activities. She suggests that young people – and in principle this applies to all ages – begin informally in a more passive mode and then
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gradually get drawn into (or are motivated) to engage in more complicated, involved and expert activities. The study is particularly interested in how young people work socially with their peers, learn through personal interaction and participation, and support mutual enthusiasms, which often leads to the production of complicated output. Of course the idea of ‘peers’ means much more the idea of equals than necessarily age-defined friends. One of the distinguishing features of these new learning networks is how young people can work with fellows of equal competence not, as in school, by age defined boundaries\(^4\).

Many of the studies in this research show young people (mainly it is acknowledged from more comfortable and middle-class backgrounds) involved in what we think of as ‘creative’ pursuits. They blog, write fan fiction, do art, make video or even animations. On the whole in these case studies they are not engaged in writing code or making exclusively digital products. They do make websites but because this research focuses on the move from consumption to participation its focus is on explicating these specific kinds of progression.

This focus on what are generally considered to be arts-based activities – however loosely defined – also distinguishes research in this field. ‘Making’, a deliberately inclusive and generic term in the digital era, is often privileged as an expressive and communicative activity because of this bias. Ito and her colleagues pay particular attention to how the digital medium facilitates a particular mode of collaborative and sharing. The quality of the learning is thus distinctively social. This is often contrasted with more individualised competitive approaches familiar in mainstream schooling. An important implication here is that these kinds of learning, even if organised around creative and expressive activities translate into modes of working which are central to the forms of production typical of the knowledge-based economy (Dumont, Istance, and Benavides, 2010; Pellegrino and Hilton, 2012). This is why digital making has such salience. Not only does it develop and support the possibility of economic growth in its own right but it may also support new forms of transferable 21st century skills.
Ito’s focus on the collaborative nature of learning and making is described as an integral part of working with digital media. There is something about the capacity to share, collaborate and communicate which is at the heart of many making processes. Whilst this might seem new and medium-specific, a study by Jennifer Rowsell (2012) about producers working across a range of media actually implies that we need to pay attention to the nature of social collaboration in many forms of creativity (see also Miell and Littleton, 2004). Rowsell takes an under-used perspective in research as she reconstructs producers’ learning histories (by ‘producers’ she means artists or at least professionals across the fields of music, media and writing). Through interviews she builds up a picture of how producers account for themselves at a moment in time. This means exploring the salient features that pertain to all media forms and industries in order to see common themes and experiences. She does not work especially with producers in digital industries and this points to a gap in the literature.

Her study argues that there are a number of common features in the histories of her producers. First, many producers tell a story about a significant moment in their lives; and this (retrospectively) indicates why they have become the professional people that they are. They point to significant others, often teachers, experiences and epiphanies that tell a story of life changing significance. Whilst it is probable that this trope is a feature of many kinds of modern biographical narrative, it is interesting that being able to capitalise on significant experiences seems so crucial to these creative people’s lives. This has an implication for the pedagogy of future creative making situations. The second feature she identifies is indeed the collaborative and social nature of working together on projects. All her producers maintain that without immersion and contiguity with a network of like-minded creatives they would not have become the people that they are. This implies the need to pay attention to how creative communities can be fostered and supported to generate a sense of belonging, as the Ito study suggests. Thirdly, her producers stress their commitment to forms of self-teaching and self-learning. On the surface this might seem at odds with the previous point but it suggests a need to be able to access the kinds of information that is relevant at particular points in an individual’s development, and has resonance for the capacity to share, collaborate and communicate which is at the heart of many making processes.
Both Ito and Rowsell therefore hint at a set of preconditions and a model of development for makers in the digital era. It is possible to extrapolate from their studies both a series of intra-personal attributes and interpersonal relationships of digital culture to offer self-teaching environments. It also suggests that these kinds of workers are in some ways enabled to know what they don’t know and can therefore seek it out.

Her final theme relates to the nexus of ideas that surround technique, craft, form and domain knowledge. She suggests that retrospectively producers realise that what they have made is often incremental and particular within specific traditions. They can see how their work is related to the genre of their choice and how they have modified and added to this tradition. They often talked about their work in terms of incremental change. Finally, all her producers talked about a way of working that is experimental and improvisatory. They all demonstrated a kind of confidence that allowed them to play about with ideas and techniques in a constructive and progressive function. As noted in Chapter 1 these processes are predicated on older craft models of learning and apprenticeship.

Both Ito and Rowsell therefore hint at a set of preconditions and a model of development for makers in the digital era. It is possible to extrapolate from their studies both a series of intra-personal attributes and interpersonal relationships (including what we might think of as forms of social capital); and in addition, media specific knowledge, ability and tradition. In addition, Rowsell is interested in common cross-media meaning-making capabilities. She explores the capacity to work in the multimodal forms, and might suggest that a certain kind of fluency and common language across more than one medium is a necessary attribute for being creative in the modern era. This too might benefit from more sustained investigation as indicated by generic creative functions – editing, composing etc – outlined in the previous chapter.

These two studies are interesting because they represent study of two moments in time: setting out to become a maker, and looking back on the process of having become one. There are, for obvious reasons (given we can never know what the future holds), very few studies of the actual process of becoming makers, and few studies of following makers in a sustained fashion over longer periods of time.
2. People and everyday life

2.1. Success trajectories

One of the few studies to explore young ‘creatives’ at a key intersection of educational and vocational sectors is the study by Oystein Gilje of young Scandinavian filmmakers (Gilje, 2012). Gilje explores young people who are beginning to publish and share films in pro-am circuits, and who are in their last years of secondary education contemplating further or higher courses of study. Gilje focuses on an informal form of organisation – the website ‘Dvoted’ – as place bringing together aspiration, professional development, learning and entry into wider cultural circuits.

Established (but now closed down) as an opportunity to bring together and promote filmmaking among young people, the online site, ‘Dvoted’ became an important semi-formal but out-of-school location. Gilje suggests it provided a focus for ambition and a way of leveraging hobby-ism to more fully-fledged amateur status. It is however, Gilje’s study of how young filmmakers move into serious creative identities that interests us here, and especially the interaction between self-motivated activity and more organised public ‘work’.

In Gilje’s study, young filmmakers who have the opportunity to complete this subject at school within a formal curriculum, as well as contribute to and participate in the ‘Dvoted’ community, reflect on their formation as filmmakers. He found that some young people position themselves against the identity offered by the school subject, that the kinds of knowledge prioritised in the school militated against other definitions of practice circulating in the community. However an appeal to an authentic art self-forged in the experience of autodidacticism and developed though peer support was important (as Rowsell suggests). The students were interested in comparing experiences of equipment and technique, as well as how making films for amateur or semi-professional purposes (local community events) were valued against school knowledge. Gilje is agnostic about pedagogical work being done by this identity formation, and it remains unclear how these attitudes support or hinder these young people as they move from school into further education, and whether such identities are necessary or will change over time.
From our point of view the study is interesting on two counts. First is how the ‘creative identity’ formed through experience and participation might need to be counterpoised to a more authorised ‘good student’ schooled identity that may seem at odds with processes in these domains. Secondly, how practical community knowledge has its own currency. As opposed to the model of informal learning pursued by Lucy Green in her important study of informal music making – where informal knowledge is curricularised and then revisited in school, suggesting on-going processes of validation (Green, 2008)⁵ – here in the work of these young film-makers, the kinds of knowledge privileged by these actors does not seem to find its validation within formal knowledge domains. It is precisely the ability of being outside school – in this case in a virtual community – that can validate these kinds of informal knowledge as a practical common sense aesthetic – which makes the ‘not-school’ locations so important within the economies of knowledge for these communities⁶.

These kinds of accounts of ‘making’ – anatomising educational trajectories, informal cultures, autodidacticism, identity work and skills acquisition are, as I have suggested, rare. There are, however a range of studies that reconstruct the making process and indeed reflect on certain kinds of key decisions – especially as they relate to wrong turnings and the trial and error nature of development. Studies of artists or scientists tend to take ‘whole-life’ biographical approaches (Miller, 2000; Galenson, 2008) and obviously focus on individuals’ interactions with wider and deeper sets of ideas or themes at a moment in time. These approaches do tend to offer us common-sense paradigms for makers and making which, because of the fame of significance of their subjects, may not always offer us very useful models.

The discipline of Science, Technology Society studies (STS) doesn’t focus as much on the individuals, and certainly not on the intersection of educational trajectory and the everyday – on the ‘how people become makers’ angle. However, it does offer insights into the making processes arguing – particularly in case of scientific work – that rather than seeing inventions as romanticised leaps of the imagination, they can be understood in the context of iterative processes and a series of socially constructed conventions, where the inherited traditions and disciplines of subjects find their expression (Latour,
1986). Insights from this discipline about shared practices and how individuals are inducted into forms of behaviour and thinking are important for this enquiry, and point to the need not only to learn skills or knowledge, but also to support young people to understand and learn how to behave in the social worlds of making communities.

Fortunately there is a range of accessible accounts of productions, especially around games and films, and these have a particular interest for us. Whilst these accounts tend to focus more on the product rather than the making, they do contain a range of material about the makers themselves, and particularly in the case of games, often contain a narrative of how the makers move from enthusiasts and modders to fully fledged producers, showing the transition from being creative as an individual property, to entry into the creative industries – a key transition for us.

Many of these accounts are easily accessible and although they suffer from a first-person version of the truth they are informative. The fact that many of these accounts are online also means that they can be read as part of a wider community and thus comments, secondary interpretations and asides add to the picture. For example, the post-mortem from ‘Smudged Cat Games’ by David Johnston gives us insight into the iterative processes required to ‘solve a particular problem of game mechanics’.

Other titles in this genre are good at showing how making is a group activity requiring communities of friends to test and re-test indie games or the need for perseverance and single-mindedness. Studies of certain in-games elements like humour and playfulness show how creators learn to de-centre themselves and meet audience requirements, as well as leaning how to reflect on one’s own interests in an objective fashion thus turning one’s own pleasures into marketable commodities. This is an important part of the creative process as games-makers explain how they can transform geek-pleasures into marketable products.

This writing does, in many instances, draw on biographical perspectives, which is why I have included it here. In these biographies, we can see enthusiasm and in particular, a transition in the mode of Ito’s work above, of progressing from enthusiast to creator. The emphasis isn’t so much on the acquisition of specific technical skills but on learning...
Mapping digital makers

2. People and everyday life

2.2 Snapshots of participation

Over the last fifteen years our understanding of participation in the digital domain has changed considerably. Surveys and studies of young peoples’ access to and use of digital technology have become more fine-grained as simple questionnaires about using digital technologies have begun to tease out deeper questions about persistent and creative use. The problem has been exacerbated by the way that much interaction online (of which Facebook is the emblematic example) seems to mimic the same kinds of activities as more creative complex actions, and this theoretical conundrum still provokes much debate. In the context of our concerns it remains a source of disagreement with those who maintain that controlled uploading and posting does not offer the same kinds of learning or the same degree of challenge as more traditionally conceived creative activities. Many scholars – in line with Ito’s progression model above – suggest that all of these activities belong on a continuum, and therefore they are worth capturing in these surveys.

The second issue that has preoccupied quantitative insights into these questions is the relative place of school and home in young people’s lives. This is obviously important in analysing differential access to equipment, but it is difficult to understand the links between time spent online and the stimulus formal education can provide to develop creative competencies. In some cases school access is almost irrelevant to young people’s interest and motivation, whilst in others it often provides crucial points of information and induction; these differences are often difficult to tease out. Given we are interested in very widely defined ‘educational’ uses, these issues perhaps remain under-explored and under-theorised.

If education policy wants to develop more creatives like this, it needs to find ways to model these social systems to reverse-engineer the particular qualities that animate such commitment.
One of the most comprehensive and complex pictures of young people’s life and learning online is the EU funded project ‘EU Kids Online’. In a recent final report, the project authors postulate what they call a ‘ladder of opportunity’ (see fig 1 p. 33). This shows very clearly that nearly a quarter of young people reach what the authors call the ‘most creative setup’ (which includes some more contributory and formal activities from blogging to file-sharing and spending time in virtual worlds). In general only about a third of young people across Europe do several of these activities.

The report shows very clearly that whilst there is a high degree of usage and access to technologies in the home as well as in the school, only a very small proportion of young people (even less than the third mentioned above) are actually making things in creative ways – as outlined in the first section of this chapter. Forms of social networking account for much of the high users’ activities, and therefore exploring how and when such activities do progress to more systematic and advanced creative use must remain a key research question.

The focus of the EU report was of course being online and not especially on creative activities, many of which may require access to more complex stand-alone technology as well as uses of online and community-based participation. A recent report examining political participation in the US – again a tangential focus to our own – does make the point that participation is not necessarily stratified on social economic status, and that many young people from minority homes can be found online. However, it also makes the point that young people are motivated and interested in using the digital world to pursue their hobbies; and the authors of this report propose a notion of ‘digital social capital’ to capture the capacities and opportunities afforded by systematic participation online. This concept attempts to mesh skills with access to networks – thus producing a set of values and capabilities which possess power and potentiality as well as describing activity. Is this useful to capture the kind of creative making behind current British initiatives?

Author of this report propose a notion of ‘digital social capital’ to capture the capacities and opportunities afforded by systematic participation online.

Notes

http://www2.lse.ac.uk/media@lse/research/EUKidsOnline/EUKids%20II%20(2009-11)/EUKidsOnlineIIReports/Final%20report.pdf

http://ypp.dmcentral.net/sites/all/files/publications/YPP_Survey_Report_FULL.pdf

Whilst there is a high degree of usage and access to technologies in the home as well as in the school, only a very small proportion of young people (even less than the third mentioned above) are actually making things in creative ways.
A quarter of children overall reach this last, most advanced and creative step. It includes visiting chatrooms, file-sharing, blogging and spending time in a virtual world. Less than one fifth of 9-12 year olds and only a third of 15-16 year olds do several of these activities. Across all ages, around a third of children reach this step in Sweden, Cyprus, Hungary and Slovenia.

Step 4 includes playing with others online, downloading films and music and sharing content peer-to-peer (e.g., via webcam or message boards). Across Europe, over half of 9-16 year old internet users reach this point, although only one third of 9-10 year olds and less than half of 11-12 year olds do so. Children in Sweden, Lithuania, Cyprus, Belgium and Norway are most likely to reach this step.

Most children use the internet interactively for communication (social networking, instant messaging, email) and reading/watching the news. This captures the activities of two thirds of 9-10 year olds but just a quarter of 15-16 year olds. Only half of children in Austria, Germany, Greece, Ireland, Italy, Poland and Turkey reach this step.

In addition to schoolwork and games, this step adds watching video clips online (e.g., YouTube). These are all ways of using the internet as a mass medium – for information and entertainment. Half of 9-10 year olds only get this far, along with a third of 11-12 year olds.

When children begin to use the internet, the first things they do are schoolwork and playing games alone or against the computer. Fourteen per cent don’t get further than this, including nearly a third of 9-10 year olds and a sixth of 11-12 year olds. Also in Turkey, these popular internet uses capture the activities of a quarter of children.
2.3 SUMMARY

Whilst it seems fair to say we have a general common sense about how people get engaged in creative digital activities, and some insight into the patterns of their progression and development (with a key focus on the collaborative and social dimension of creative communities), we also don’t know a great deal about what triggers participation, nor why some young people might drop out of such trajectories and some continue. More research is needed to explore catalysts and disconnects in young people’s lives. Whilst all the research reviewed in this chapter is clear about the development of technical competencies and skills, it is notable that they don’t figure highly in accounts as being the most crucial barriers to development: this too needs more investigation, especially into how it affects people at different stages in the life-course. Above all, it seems as if we don’t have much evidence following learning across sites and within communities with any but the most obvious idea of how to describe progression in creative making. Whilst most of our understanding of making is retrospective, this will remain a gap in the knowledge base.

We do know that only a very small proportion of young people are involved in sustained and developed creative activities. We don’t know enough about who these young people are (in social terms), and we also don’t know enough about the interrelationship of at home, informal and formal educational drivers. Situating young people in creative communities would seem a sensible way to understand how individuals do and do not progress. Finally it would be useful to know much more about the interrelationship of different knowledge domains, as Rowsell implies above – how, for example, skills in music or writing interrelate with using, publishing and sharing products. We need more fine-grained pictures of young producers, and we might anticipate that these too will vary across the life-course.
3. Curriculum interventions and innovations

Whilst the previous chapter concentrated on people and their trajectories, this chapter is concerned with the range of interventions on offer across the full spectrum of educational provision that support and develop digital making.
It is how we can integrate these different kinds of initiative as meaningful experiences for individuals in particular circumstances that will determine the success of the larger ambition.
3. Curriculum interventions and innovations

3.1 INFORMAL KEY MOMENTS

The suite of applications developed by Mozilla and available at ‘webmaker.org’ is an excellent example of an open and imaginative approach to supporting learning on the digital making spectrum. However, this intervention also illustrates the difficulty of turning the process of deconstructing consumption into production. They also expose the challenges of integrating informal learning into more structured progressions.

The principle behind X-Ray Goggles\(^\text{17}\) and which underpins a series of activities in the Webmaker suite is the ability to show how the web is made from code. A simple browser plugin allows users to see how any web page is made up of discrete elements. More sophisticated tools, like Thimble\(^\text{18}\) build on this insight, allowing users to manipulate discrete elements within a web page and to customize and substitute elements (for example individual pictures) in order to ‘re-mix’ and ‘own’ what looks like published content. The openness and accessibility of these free resources sets a new standard in open education, and they do not prescribe single kinds of use. Indeed Thimble, for example, lies underneath a series of more developed offerings, such as customising a Tumblr page or making an animal (in association with the Royal Zoological Society) also available from the same resource.

To date, Mozilla has not engaged a systematic review of how and where these resources are used. This is important because the tools, where they exist, and the projects in which they are embedded, embody a particular theory of learning. At the first level, these tools follow a familiar concept of making the familiar seem strange, and of showing the workings ‘behind the scenes’. This is a common device across many disciplines, but it will have additional salience as it exposes the workings of web sites/pages familiar from daily use. These kinds of estrangement tend to offer a recursive way of engaging with a revelatory conceptualisation – that these ‘realities’ are in effect forms of code; the tools thus allow for some kind of extended play with this conceit, albeit one which tends to reiterate the key concept. This principle also underpins the third in this suite of tools, Popcorn, which allows for structured kinds of revision of moving image media online. Authors can rewrite some sound channels and

\(^\text{17}\) https://webmaker.org/en-US/projects/remix-your-favorite-webpage/
Mapping digital makers

3. Curriculum interventions and innovations

Indeed this element of trial and error playfulness, of learning how to behave like a participant consumer in these environments also connects these tools with other interventions within young people’s lives.

A key feature of digital creativity is its collective, collaborative and social nature.

See for example: www.englishandmedia.co.uk/publications/index.php

See http://dmlhub.net/sites/default/files/9780262518376_Measuring_What_Matters_Most_0.pdf for an extended discussion of some of these principles.

Studies following these kinds of crossovers are notoriously difficult to design and implement. Perhaps the field of game studies has pursued this most rigorously: see, for example: Stevens et al 2008.

change some visuals (within limits) in say for example, YouTube videos. This is an ambitious and dynamic tool that allows users to interact with current on-going material. It builds on early forms of media education – where bounded play with published output not only allowed young authors to learn about the materiality of ‘authoring’ moving image media in all its complexity, but also shows how and why certain conventions of genre structure form and content. However unlike this tradition of deconstruction/reconstruction from the media education mode, these tools (because they are tools rather than extended educational interventions), do not engage more formally or systematically with the wider social and political questions of copyright, form, genre etc.

Whilst I have no doubt that some of these tools will become more extended interventions in this tradition and, as such innovations are developed, they will become more formally curricularised, the existence of these tools also raises the question of how to assess the value of informal learning experiences – that is activities individuals might undertake by themselves, as driven by interests and in a causal fashion.

The playfulness of making new material with Popcorn emulates the edutainment of many commercially driven leisure activities, and is often part of the pleasures of successful games like Minecraft or Little Big Planet. Indeed this element of trial and error playfulness, of learning how to behave like a participant consumer in these environments also connects these tools with other interventions within young people’s lives. Finding out more how they are used, how such modes of learning do and do not cross over with more formal curricula, and whether they fulfil a role in education for a kind of participant consumerism might well be fruitful ways of developing initiatives like this further.

3.2 THE ROLE OF COMMUNITY

As the previous chapter noted, a key feature of digital creativity is its collective, collaborative and social nature. This is both a question of working with others as well as learning how to behave like a participant consumer in these environments.
as how the culture of the learning itself is now mediated through these open social environments. This subsection explores learning at a project level – sometimes in holiday, non-formal or community–based locations, sometimes as after-school clubs, or others as interest-driven projects within the more formal school day. The issue here is that they all bring together young people into a time-bounded social space that to some extent requires organisation.

One of the most established models is the US based Computer Clubhouse, working out of MIT and utilising a constructivist theory of learning (Kafai, Peppler and Chapman, 2009). One key advantage of Clubhouse is that it has been the site for a range of research interventions and thus writing about it can offer a nuanced appreciation of its achievements (Kafai and Peppler, 2011; Peppler and Kafai, 2006; Peppler and Kafai, 2007; Peppler, 2011). Studies of learning within this project have been keen to make the case that whilst the overarching goal of the activities has been for students to learn about (in the beginning) computers and subsequently more varied forms of digital production, the thrust has been of moving away from a narrow computer focus towards a more general expressive and creative culture. These studies make the case that such activities need to be situated within an understanding of broader social engagements. This is both to make the project more socially inclusive, reaching out into non-middle class homes but also situates creative making as an inherently communicative process – making meaning for and with others and not just as an arcane technical process.

3.2.1 ‘Hard’ and ‘soft’ models of learning programming languages
Clubhouse also occupies a particular position within debates about the relative merits of teaching formal code or drag ‘n’ drop object oriented programming, as represented by the language Scratch or the Lego Mindstorms units (and language). A key debate within the digital making field is the value and purpose of teaching (and learning with) such languages as opposed to moving more directly to the ‘hard’ core programming languages in use by the industry. We have already seen how the tools described in the previous section offered learning directly in HTML and CSS – they are opposed to the Scratch philosophy which argues that a more accessible and ‘intuitive’ language supports creative making more directly.
In some ways this opposition is both an ideological and a practical debate. It is a practical debate where discussion centres on the age and experience of the learners; where the discussion is on the accessibility and importance of drawing learners into conceptual rather than solely technical decisions. It becomes more ideological when discussion centres on the utility of learning programming languages, and the fact that Mindstorms and Scratch represent another level of obfuscation between the maker and the code. In some ways this tension recapitulates wider discussion in society around literacy where the debate is between proponents of teaching grammar and, for example, reading for meaning. Where debate becomes polarised it often becomes the focus of attention almost in its own right. Practical questions about difficulty, progressions, the discipline of repetition and the exclusive nature of coding make this a terrain for clashing educational philosophies as much as it is a debate about digital creativity.

### 3.2.2 Competitions events and hacking

A key organisational trope in initiatives developed in the non- and semi-formal learning sectors is the use of competitions and events as a way of framing the learning. This is significantly designed to emulate the time-bound and goal-oriented nature of professional production, and it additionally has the effect of bringing together people to develop the kinds of communities that underpin production cultures across a range of industries. The Wolfram Programming Challenge, Kids Code Camp, Young Rewired State, Mozilla’s Hackasaurus and BAFTA’s Be Very Afraid events are well known within the technical/coding end of the creativity spectrum. There are few evaluations of the success (or otherwise) of this model of organisation, of the particular learning that they afford and the relationship of these to more everyday or formal education experiences. This is another absence in this field. Non-academic accounts tend to emphasise the time-limited and public nature of the event, as well as the extra-ordinary access to resources that such competitions frequently support. Finding a way both to integrate the profiles of other production domains (film, music) into the publicity circuits of these events would help situate such competitions within the larger field of digital creativity. By the same token, a strategy to introduce more technical/coding elements into other creative arts fields as a way of repositioning the full spectrum of digital creatively might help broaden its appeal.
A key theory of learning underpinning one important range of events is that of hacking. The recent development of hackspaces to support hacking-as-learning underscores this interest in turning what are frequently conceived of as anti-social activities into pro-social production processes. Again, there is little study of hacking as a theory of learning. We don’t know how learning to hack pre- or post-dates a baseline knowledge about how computers/code works, and we don’t know how learning to hack can complement or supplement formal knowledge. There is much common sense about the way that hacking is interest-led, and this is modelled on the principle of finding how things work by taking them to pieces – in the mode of classic engineers from Franklin and Brunel to Dyson. However, such a model of learning may be overly romantic. Whilst the model of the autodidactic community (such has been described lying behind Linux: Castells and Himanen, 2004; Himanen, 2010) has been cautiously extrapolated as a new business model, it remains more a tenet of faith than of evidence of how it might work as a way of galvanizing learning – however much such assumptions inform the retrospective accounting we saw in the previous chapter (see also Blyth’s 2012, study of the BBC Micro).

A recent development in making communities has been the development of hardware to sit alongside the software and online projects discussed so far. Raspberry Pi, Arduino and 3D printers are some of the best known innovations in education at the moment. There isn’t much research to date exploring the specifics of learning in or with these new media, and little comparison and contrast of theories of learning at work with the physical digital object and its virtual form (online/software). It is not clear whether there is a conceptual educational distinction at work between the category of ‘objects’ in this way – as might be said to exist within the Design and Technology tradition (Garvey and Quinlan, 2000). More research will no doubt be commissioned exploring issues around learning within the range of settings, contexts and ‘things’ that now comprise the digital realm.

By way of final comment to this section, it should be noted that many of these non-formal communal initiatives exist both in community-based projects and in stand alone individual options (as described in some of the Mozilla inventions above or the popular
We are clearly living at a time where an imaginative range of resources is being offered at all levels of the education system. Their take up and growth will depend much on their intrinsic qualities and their usefulness to other life-long and life-wide trajectories. More sustained understanding of their impact and effectiveness by young people across a range of social situations is necessary to fill out this picture.

### 3.3 Classrooms and Syllabi

Chapter 4 will address some of the recent debates in the UK about computing in schools. Here I want to map a range of curriculum models in place for teaching digital creativity.

#### 3.3.1 Integrating digital creativity across media

For historical and theoretical reasons, it is rare to find common principles of digital creativity across the subjects in the English School curriculum. ICT (Information and Communication Technology) is (currently) concerned with the ordering and manipulation of data (information) and the processes required to do this. At the Key Stages aimed at older pupils, there are references to making and communicating but on the whole, the curriculum is aimed at supporting fluent everyday use of computer technologies, and thus is about familiarisation with common software packages bound up in a consideration of data management. This model of ICT thus neither connects with the more traditional and code-based idea of computer science (more how computers work) nor with the uses of digital technology in media making. ICT plays a discrete role in, for example Music technology (sometimes a part of the Music curriculum) and equally in Design. Media Studies (for older students) tends not to require or to explicitly develop complex use of digital processes, except when it takes on a role as ‘media arts’ where it becomes a place for work in production processes.

Whilst programmes of study with older youth at A level or BTEC may integrate production with experiences of digital processes, current curriculum structures and
### Digital skills as basic skills

<table>
<thead>
<tr>
<th>Field of skills</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communicate</strong></td>
<td>Can use simple digital tools and media for presentation and communication.</td>
<td>Can use a selection of digital tools and media for presentation and communication.</td>
<td>Can make varied use of different digital tools and media to convey a message both in one-to-one and group communication.</td>
<td>Can use digital media and tools to convey a clear and detailed message for communication and documentation.</td>
<td>Can choose, assess and apply digital communication tools according to different subject-related needs.</td>
</tr>
<tr>
<td><strong>Digital judgement</strong></td>
<td>Can follow basic rules for digital interaction. Knows basic rules for protection of personal privacy on the Internet.</td>
<td>Can apply basic netiquette and knows about rules for protection of personal integrity on the Internet.</td>
<td>Can apply netiquette and follow rules for protection of personal integrity on the Internet and in social media.</td>
<td>Can use the Internet and social media efficiently and appropriately.</td>
<td>Can reflect ethically on and assess the Internet and social media as a communications and information channel.</td>
</tr>
</tbody>
</table>

Table 1
Framework for Basic Skills. This Framework is a tool for subject curricula groups appointed by the Norwegian Directorate for Education and Training to develop and revise National Subject Curricula. It has been approved by the Ministry of Education and Research. Oslo, 11th January, 2012.
How useful and indeed valid a progression model, which builds on an historical recapitulation of disciplinary development, is for the current era.

3.3.2 The metaphor of code (as language)

In the curricula aimed at the formal classrooms that specifically teach coding the idea of ‘code’ is explicitly described as a particular kind of language use. In the 2009 sample teaching units produced by Computing at School, coding is described in terms of accuracy of expression, controlled use of syntax in addition to understanding algorithms, the formal properties of programs (if they are games, for example), and the sequence of actions involved in the whole process of program-making. We have already noted the analogy between teaching code and particular models of literacy education: here the linguistic nature of coding is made even more explicit. The same pedagogical question about whether learners need to know the rules of language in order to able to use that language (and with what degree of access to a meta-language) applies to the teaching of computer programming as it does to the use of one’s own or another (foreign) language.

Like the argument in the previous subsections which discusses atomising common processes rather than developing links between them, these kinds of curricula only act...
3. Curriculum interventions and innovations

as a way of perpetuating different models of the same process for learners. There are no agreed common or core ‘meta-level’ understandings at work across current conceptualisations of the curriculum, and it may be that rather than thinking of digital creativity as an addition, here it might be more helpful to see it as way into defining strong common underpinnings to understanding. In the previous chapters we have considered how the digital era may encourage more generic notions of what it means to be a digital creative, considering the idea of composing and editing as master metaphors crossing what used to be discrete production domains. Coding fits this paradigm too. Teaching the pure coding of computers may well be advantaged if there are complementary and analogical uses of the term. It is used in literary scholarship (and Media and Communication Studies) to describe narrative features and in Biology in relation to genes and DNA, for example. Coding may well be a feature of digital creativity in a generic as well as a specific sense. This is, however, only implicit in current curriculum formulations.

3.3.3 Critical, social and political dimensions of digital culture

Although not always expressed in the terms of this sub-title, all of the subjects and indeed all the different versions of ICT we have talked about so far all include an element in their programmes of study considering the social use of many digital products. Gaming and playfulness infuses syllabi aimed at younger students – with the ‘gamification’ of the whole curriculum playing a part in the innovative US based, Quest-to-Learn school, and making games is a key part of the Computing programmes of study we have just explored.

There are two issues here. The first relates to how school learning defines its relationship with the popular culture enjoyed and experienced at home and in leisure use. If school curricula want to build on these kinds of experiences, school in general and teachers in particular, need to find ways to make positive experiences about the pleasures of digital culture. This is usually a fraught question as traditionally school and home occupy separate moral spheres. One element of this is framed as consolidating the roles of parents and home in schooled learning, suggesting a ‘flow’ of activity between these traditionally disparate locations (Grant, 2009). More problematically

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Notes

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28 See http://dmlcentral.net/blog/ben-williamson/coded-curriculum-new-architectures-learning
for an extended discussion of code, curriculum and learning

29 See also: www.puremash.com
has been how schools themselves draw the realm of out-of-school culture into the curriculum, as well as the forms of popular entertainment and even popular technologies like mobile phones – a device many schools find difficult to manage. Because of concerns about risk and discipline, there is often a separation of the home/school lifeworlds as if they existed in parallel to each other, and with popular platforms (from Facebook to Xbox) usually kept at arm’s length from study in school.30

Of course this leads us to our second point: in many cases, the place of these pleasures within formal curricula is often as objects for deconstruction – for the school to support students to develop a critical and informed contextualisation about the production and circulation of these artefacts. Curiously enough both seemingly contradictory approaches can be found in many of the ICT and other creative syllabi currently existing in the digital creativity field. Most subjects from Art, to Media Studies, to ICT and beyond all contain units encouraging reflection and understanding of the wider socio-political context and encouraging critical reflection about these wider questions. It is however, notoriously difficult to evaluate long term effects of these critical social ambitions both in a general sense (of seeking to know and understand non-academic outcomes: Ladwig 2010), and the more narrow attention to whether we can say how introducing students to critical perspectives around technology impacts on them across their lives. David Buckingham’s (2003) review of media education described a long history of how making can support critical understanding, and how this can encourage a more critical and contextualised understanding of production and the making process. This additionally meshes with constructivist beliefs in how making is a better way of understanding than simple instruction (Papert, 1993), and lies at the heart of some of the new orthodoxies about critical participation (Jenkins et al, 2007).

However, there are few ways of testing these hypotheses, and finding general ways of understanding long-term impact is a difficult challenge that few know how to even begin to answer (Pugh and Bergin, 2005).

Like the argument in the previous two subsections, I would suggest that any new initiative around digital making needs to find a way of integrating these hitherto opposed types of understanding – of reconciling the place of out-of-school cultures

David Buckingham’s (2003) review of media education described a long history of how making can support critical understanding, and how this can encourage a more critical and contextualised understanding of production and the making process.

30 See projects like The Class as research designed to investigate this interpenetration of in- and out-of-school dichotomies: http://www2.lse.ac.uk/media@lse/research/The%20Class.aspx
It is clear that there is a need for an overarching set of principles about digital creativity, which can find a way of picking its ways between the different purposes of teaching, learning and pedagogy, as well as reflecting on the digital worlds which young people inhabit today.

**3.4 SUMMARY**

This chapter has focused on unpicking the different and at times contrasting theories of learning at work in informal, community-based and non-formal sites of learning. In turn these too have been contrasted with some of the key principles underpinning syllabi in the broadly defined digital creativity curriculum areas at school.

There is a dearth of literature exploring the transfers across and between these different sites of learning, and a host of suspicion and assumptions about these domains from the perspective of the other. There is a need for more systematic evaluations of learning within a range of the new sites for digital creativity that are emerging today. As the chapter has unfolded, it is clear that there is a need for an overarching set of principles about digital creativity, which can find a way of picking a path between the different purposes of teaching, learning and pedagogy, as well as reflecting on the digital worlds which young people inhabit today.
This chapter focuses on more formal policy documents and public pronouncements around digital creativity. The purpose of the chapter is to get a sense of what aspirations lie behind the various formulations of digital creativity and how they are mediated through ways of imagining how learning this field actually takes place.
Questions about the move into work and turning learning into productive capabilities are often explored in this domain, rather than treated as empirical questions to be answered through research. In some ways this chapter attempts to offer an insight into the hope and imaginaries that often lie behind educational policy – what kind of world do we want to build and why – and what might be the place of digital making in such ‘futures’.

As we have already seen there is no obvious and agreed place from which we can begin an interest in the practices of digital creativity. It isn’t ‘held’ or owned by any single major curriculum policy stakeholder. We have already noted how the disciplines of ICT as well as that of computers in education have become the default curriculum spaces for interventions: yet both of these traditions are also concerned with other uses of digital technology as well as that of creativity or making.

The chapter is in three sections. It first looks at policies around the creative and cultural industries, and secondly broader ideas about digital citizenship and digital literacy, before examining vocational training and the role of industries in qualifications for digital creativity.

4.1 Creativity and the creative industries

In the late 1990s, the place of the cultural and creative industries as a discrete economic sector became firmly accepted in public discourse. Creativity was seen to underpin a range of production sectors (especially within the arts and cultural sectors) and could be said to contribute quite specifically to economic growth. The section in the 2012 London Olympics opening ceremony celebrating the export of British culture (music, films and the Internet) sums up the realisation of the importance of these developments. Policies were developed to support and enhance these fields. These covered a diverse range of actions (many of which are not covered by the remit of this report) from economic regeneration, urban planning, creative industries clustering, higher education knowledge sharing, entrepreneurial and business start-up support and
training, taxation arrangements and so forth. Increasing the public profile of individuals from the creative industries, supporting employer-led training to work with the emerging sector skills councils (for example, Skillset), developing appropriate vocational qualifications and, in particular developing links between companies, industry and higher education helped cement both the status of this kind of work and to align employer needs with training.

Interventions in statutory education revolved around a generic notion of creativity rooted (though not exclusively) in the cultural industries. The 1999 NAACE report\(^3\) led to a range of initiatives in formal education, of which the best well known was Creative Partnerships\(^4\). This program supported curriculum and school change, as well as additional projects through brokering partnerships between artists and other creative practitioners and schools working with young people of all ages up to 16. The broad emphasis was on developing creative capabilities. These included types of thinking skills, attitudes and relationships, forms of communicating and presenting oneself, as well as supporting risk-taking, problem-solving and general imaginative abilities. In many ways these capabilities matched broader policy interest from OECD and other international bodies concerned to develop 21st century skills (Dumont, Istance, and Benavides, 2010; Pellegrino and Hilton, 2012). In some cases, forms of digital creativity and digital making were used as exemplars of these policy directions. The attention in the digital making literature to production-based competencies, the use of open access knowledge domains and an interest in kinds of cultural expression (web, music etc), meant that digital making was often not disaggregated from more generic creativity ideals Loveless, 2008.

A key aspiration behind these initiatives is the belief that in very broad terms the labour market is changing towards a need for workers who are more self-reliant, self-motivated and capable of forms of self-management (Guile, 2006). From this perspective, digital making is not so much preparation for employment in a specific subset of the creative industries, but more an orientation to prepare young people for a kind of workplace and a type of work identity, as well as supporting personal expression and participation in a wide conceptualisation of digital cultures.
4. Policy aspirations

4.2 BECOMING DIGITAL CITIZENS AND INFORMED CONSUMERS

The second policy area where we can see an interest in young people and digital creativity comes out of policies concerned with citizenship and consumption, where the common language and shared linguistic frame draws on the idea of ‘literacy’ – as in ‘digital literacy’ or ‘media literacy’. In the UK it has been the media regulator, OFCOM, which has led much of the principles and research in this domain. There are three threads to this concern.

The first has been led by anxiety as parents, teachers and other adults have raised a series of questions about the risks involved for young people being online and participating in digital cultures – including those which might lead to creative expression and wider participation. A series of high-profile incidents including sexual predation online, identity theft, bullying and a host of unpleasant and problematic experiences especially around the popularity of social networking sites (i.e. ‘sexting’\(^{35}\)) has raised policy questions about the safety and security of young people to act unsupervised in the digital domain.

An important policy ‘solution’ to this challenge has been the development of digital literacy campaigns to equip young people with the knowledge, information and skills to protect themselves against these putative harms. However, the idea of literacy used in this context brings into play other broader qualities, and in many cases the definitions of literacy as advanced by the media regulator and in curriculum areas influenced by this perspective, themselves include notions of creativity. Digital literacy involves a creative dimension too (Buckingham, 2003). Of course, literacy is one of those terms that carries a huge weight of possibilities with it, and in other contexts it has not been used so specifically to reflect such prophylactic ambitions: it does indeed capture a full gamut of creative and expressive possibilities\(^{36}\). Whilst there is an extensive literature exploring digital literacy in terms of creative potential and expressivity, it should be noted that from a policy perspective the last ten years or so have tended not to cast literacy in this light (quite in opposition as we have already noted to many other countries’ formulations of digital competence).

\(^{35}\) www.nspcc.org.uk/inform/resourcesforprofessionals/sexualabuse/sexting-research-report_wdf89269.pdf

The third element at work here is the role that digital literacy plays in the development of informed citizens especially as informed consumers. Here policy concerned with education to protect young people merges with the idea of producing informed consumers who can distinguish between market choices and act fairly, sensibly and rationally, and also with the idea of digital citizenship. This means both the capacity to take advantage of the services online but also to act effectively and responsibly in communities and other kinds of civic fora. At the European level particularly, there are a number of projects supported by a common framework where kinds of creative participation are subsumed into a larger civic agenda. The recent ‘Digital by Default’ policies and recommendations embrace these ideas about literacy and citizenship.

As in Section 3.3.3 above, we are faced with the same methodological dilemma about knowing more precisely how the process of making affects our literacy capabilities and also then, how such literacy might extend beyond schooling across our lives. As noted in that section, whilst there is consensus about how making is a reliable and trusted pedagogy for developing critical understanding, it is more a tenet of faith about long-term impacts.

4.3 WORK, SKILLS, COMPETENCE AND COMPUTERS

The third policy area where we find ideas about digital creativity has two aims. The first of these relates to transition from formal education into the workplace and includes a wide range of training and education at both further and higher education levels. The second quite specifically relates to labour needs in continuing to develop those industries, which rely on discrete ‘computing’ skills. The recent report by NESTA, NEXT GEN skills and the series of initiatives around coding and an ambition to reignite British computer culture belong to the second part of this strand.

Ideas about both the past and the future play a particular role in these aspirations. Reflecting on a relatively recent growth trajectory in the high-value computing games industries, it has been suggested that current education practices are in some ways
Speculation about a revival in forms of digital manufacturing have created the idea that the kinds of national skill set possessed in the past may not now currently exist and be able to take advantage of future opportunities. In these contexts digital creativity is imagined primarily in terms of ‘hard’ programming skills and is thus interchangeable with the idea of coding. Here, coding means simply programming, rather than as in the last chapter an elaborated idea of un-picking how things are made. Education policy in schools with these interests focuses on the transmission model of teaching computer science with a view of meeting labour market gaps and deficits. In general, this is a particular view of the purposes of the education system, and does not reflect some of the other consensus around the nature of learning, the need for broad courses of study and an inclusive and accessible curriculum. However, such principles are very much a matter of contemporary political debate.

Of course, the nature of putative workplace skills deficits and indeed the reverse – working out what skills will be productive in the immediate future – are complex empirical challenges. There is always a time lag in this relationship that can be found in any system reconciling training and employer needs. The bureaucratic nature of accreditation often works too slowly for fast-changing economic business needs. The challenge is complicated by the fact that (unlike Singapore, for example) the UK does not have a national labour strategy, and that to some extent it possesses a complementary set of stakeholders, all of whom have considerable historical and market independence from each other – and to some extent from central policy making.

We have already explored the limits of policy reform at school level but the situation is even more complex at University level (including both undergraduate and postgraduate qualifications). Whilst in some cases degree standards can be endorsed and to some extent regulated by professional bodies (for example, how the Engineering Council)

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For examples of the UK’s making heritage see: www.vam.ac.uk/content/articles/p/powerofmaking/)

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For studies of possible future growth see: www.guardian.co.uk/technology/2012/jul/01/build-satellite-shed-new-diy-revolution; www.economist.com/node/21540392/ and texts like that described in: www.guardian.co.uk/technology/2012/sep/18/chris-anderson-internet-industrial-revolution
works to regulate engineering degrees), the quality of the degree is a matter for the academic integrity of the awarding university. The growth in qualifications, in for example computer game design is primarily the responsibility of the awarding university, whatever the local connections between university and employers and the role of work placements within such qualifications. In some cases (and the cluster of industries around the University of Dundee is a prime example in the UK) companies and industries will work alongside universities as a de facto supplier of skilled labour. In general however, these kinds of arrangements are not usually a matter for national policy intervention even if they are part of local or regional settlements.

The UK does however operate a network of sector skills councils, which bring together employers, educational institutions, trade unions and the voluntary sector. In many cases industry specific sector skills councils accredit and regulate qualifications and can drive and control new forms of accreditation. These agencies represent the labour market mechanisms to mediate supply and demand of skills, and to some extent are the places where we might expect to see the planning and policies needed to underpin innovation and growth. One curious anomaly in this debate in recent years has been a contradiction between undersupply of specific skills and an oversupply of interest and qualifications in the creative sector, perhaps reflecting a tension between more popular and arcane notions of digital creativity.

However, what we have so far referred to as forms of digital creativity or digital making describes a set of activities and practices that is in fact covered by three discrete sector skills agencies:

- Creative Skillset, which regulates training in the creative industries (more strictly speaking, media, film, broadcasting and photography); 
- Creative and Cultural Skills, which has responsibility for employment in the cultural industries (including traditional arts values and practices); 
- and finally there is the work of the IT industries covered by the e-skills agency.

The UK does however operate a network of sector skills councils, which bring together employers, educational institutions, trade unions and the voluntary sector. In many cases industry specific sector skills councils accredit and regulate qualifications and can drive and control new forms of accreditation.
Whilst all three agencies work in a similar fashion developing occupational standards, vocational qualifications, apprenticeships and bring together employers and training institutions, to some extent the fields of activity that we are discussing in this report criss-cross all three agencies. Whilst computer gaming industries work with Creative Skillset, it is as likely that e-services companies will have connections with e-skills. It may well be that the opportunities afforded by digital convergence – which we have banded together under the umbrella of digital creativity – receive a certain duplication of attention or conversely fall between different bureaucratic responsibilities. It may well be that devising and developing core competencies in digital creativity, which can then work across the remit of all three agencies, might well be a productive way to take some of these concerns forward.

A key rider to this discussion is the fact that sector skills agencies are not themselves singly responsible for the development and accreditation of the teaching workforce, including both accredited assessors in the workplace as well as professional educators. Whilst sector skills agencies regulate qualifications and can drive accreditation in specified areas, they are not themselves accrediting bodies that take the responsibility for the day-to-day processes of teaching and learning.

Finally we need to note in this subsection that, in general, the theory of learning underpinning vocational qualifications and occupational standards is competence driven. The emphasis is on the performance of discrete skills and conventionally relies on a build-up of evidence demonstrating a ‘can-do’ model of attainment.

4.4 SUMMARY

This chapter has suggested that policy interest in the field of digital creativity is dispersed and fragmented. It is segmented within and between different levels of the education system and education sectors. We have seen contrasting theories of learning and different traditions of what constitute attainment and understanding. Generic and person-centred approaches to developing creativity have tended not to include the
digital. This may partly be because we have inherited an idea of creativity as imaginative and organic, whereas we still tend to think the digital pertains to the age of the machine. A generative and embracing conceptualisation of digital making can be framed and given value through the idea of literacy. However, policies around literacy tend to use the term in its most restricted meanings. This has hindered a wider understanding of how the actions of digital creativity can underpin diverse educational experiences crossing from the home to the school and back again; and additionally has failed to help a wider understanding of how digital citizenship can connect with contemporary forms of expression and communication. The separation of authorities between further, higher and workplace education seems to have weakened and watered down economic imperatives in the digital area. The continuation of discipline-specific traditions of learning and ways of working seem to militate against the convergent and integrated nature of digital making. Again such insights and such evidence from the way the world is now working do not seem to have found their way into many policies in this area.

Tensions between a computer science interest, a digital culture approach and a social use of technology focus have confused policy concerns for school-age young people. There is an absence in the policy rhetoric of ways to devise and develop productive ways of connecting different formal and informal learning domains. The creative elements of participating in digital culture – which are central for many young people and which may well be important in the wider political discussion about forms of social participation – do not seem to have found their way into formulations about core digital competencies.

Of course policy is not the same thing as fact: contradictions, desires and confusions muddle through and people and institutions continue to work creatively and productively. If digital making and developing forms of digital creativity are deemed to be absolutely crucial principles for learning, education, training and economic growth, then a more coherent inter-sectoral set of principles need to be articulated and agreed at different levels. If digital literacy is too controversial, then it may be that an idea of a core digital competence might be a useful way forward and can operate across the different sectors we have analysed here.
5. Conclusion

The purpose of this conclusion is to revisit the aims of the report outlined in the Introduction. I will then move onto suggestions for a broad research agenda – covering work that has not been investigated and outlining questions that seem to be emerging from contemporary practice.
The Introduction suggested that there were three main areas of enquiry. First, questions about learning and the economy. Here we wanted to know what evidence exists to explain the relationship between qualifications (and training routes) and employment, with a particular interest in ways how a broad notion of digital making experiences might impact on, and be affected by, changes in the economy and production practices. Secondly, we wanted to explore understandings of how people develop expertise, experience and skills in digital making: how this relates to their sense of themselves; and particularly how these capabilities might develop along life-course trajectories evidencing learning progressions. Finally, we were interested in the evidence base behind assumptions about civic and community-based forms of digital participation and how digital making might contribute to changing wider social relationships. A set of supplementary questions were interested in:

- the material nature of digital making in all its manifestations, and its relationship with other craft histories and discipline-based traditions;
- the relevance and impact of different kinds of institutional definition, especially around ages, capabilities, formal and informal learning;
- differing and contrasting theories of learning that underpin competing definitions of digital creativity.

Even though this report has circled between broad definitions of digital creativity and narrow conceptualisations of digital making on a continuum, one salient feature of the literature surveyed here is that this topic and area of enquiry is clearly dispersed across a range of disciplines, policy foci, educational locations, curricula and theoretical interests. Some of the interest is rather specialised (especially around coding, in Chapter 3 for example) whilst in other instances (for example digital citizenship, Chapter 4), there is widespread and general interest.

The nature of the evidence base even across these fragmented fields of study is also uneven. Chapter 3 suggested there are a quantity of accounts of developments in
practice, especially of innovative technology and teaching. There are very few systematic studies either of individuals or of cohorts, and there are very few accounts of progression. There is very little understanding of what might be thought of as transfers of understanding and activity across domains, art forms and academic disciplines.

The strongest evidence, suggested in Chapter 2, seems to point towards a quite well rounded understanding of young people's engagement in a wide range of digital cultural activity. Whilst we tend not to have very detailed accounts of how specific skills and interests emerge out of this 'soup' of activity, we do seem to have a fair understanding of a range of engagements. We don't seem to have a clear understanding of how particular individual trajectories emerge from more generalised activities into specialist interests and thence into employment. Most of the accounts we have seem to focus on the broad general and culturalist end of the digital creativity continuum.

Chapter 2 suggested that research tends to cluster around an interest in the expressive and civic dimensions of participating in digital cultures, and seems to point fairly urgently towards a significant gap between the possibilities afforded by the technology and actual day-to-day usage. Most activity is still relatively 'low level' and does not seem to become catalysed into more systematic and engaged forms of participation. There seems to be disconnects between casual and leisure use and the sort of deeper engagement that might be provided by study, either from within the education system or outside it. Enabling young people to find the routes into these deeper forms of engagement is still a policy challenge.

There seems to be little research into the motivations, barriers and achievements of those actually working in the broad spectrum of digital creativity industries. We do know more about their formal qualifications and classic demographic indicators (such as the overrepresentation of privately educated journalists), but the range of professions and skilled labour found in these sectors has not received the same degree of interest or attention.
Chapter 3 noted that there is clearly a range of different educational philosophies and theories of learning underpinning both policy and practice-led interventions at work across the domains we have explored. There seems to be two issues here. First, there is a question about what constitutes the specifics of digital creativity, both in relationship to the medium and the convergence of older and other disciplinary creative traditions. Secondly, there are different models of learning at work across different kinds of initiatives, ranging from an interest in conceptual understanding to the transmission of discrete technical skills. It would be wrong and entirely impractical that debate would be otherwise, but more developed agreement around core issues – which will probably only emerge around some canonical texts and practices – might help develop consensus.

There can be no doubt that digital creativity, digital making and participation in digital culture are key concerns for social, economic and political policy as described in Chapter 4. The fields, however defined, are going to preoccupy teachers, learners, families and anyone who is concerned with Education, at all levels. In some ways it is a little extraordinary that this topic has not received more interest and is not more central to the language and concerns of educational policy. However the topic now needs to move more centre stage, and by way of conclusion I offer the following suggestions as a way of bridging the knowledge that we do have and securing the foundations of an evidence base.

5.1 Recommendations

Research and knowledge-sharing needs to be developed in three main areas. As the last chapter suggested there is a need for an overarching conceptual framework to underpin curriculum thinking and innovation across discrete fields of action. I propose:

1. Exploring, anatomising, and re-conceptualising digital creativity, making or digital literacy or some new term bridging these ideas as an integrated concept across, as part of and as discrete from other creative production disciplines. Such a concept
As Chapter 2 in particular explored, we do not know very much about the ‘creative trajectories’ of people who are interested in, study and then become employed in a range of digital creativity occupations. I propose:

2. Modelling growth, developments and progression in creative people (or people engaged in making and devising) as they move across and between different life-course experiences in respect of participation in digital creativity. Such modelling needs to focus particularly on the catalysts and disconnects that enable or hinder individuals to continue to develop and include their developments at different stages of the education system and into employment.

Finally as Chapter 3 noted, there is a real problem of collecting evidence about learning in the cutting-edge projects, of securing the status of such research, and of building up a broad-based, theoretically informed body of knowledge in this field. I thus propose:

3. Investing in and sharing systematic accounts of learning digital creativity in a range of educational locations (at home, in the community, at school, college, university and at work), including case studies and quantitative measures in order develop a more consistent evidence base to support on-going initiatives.
References


Notes


About Nominet Trust

Digital technology enables us all to think radically differently, to stimulate new forms of collaboration and to mobilise new communities of interest to take action for social good. It offers us phenomenal opportunities to inspire the creativity and compassion of millions of users in addressing social needs.

At Nominet Trust we bring together, thoughtfully invest in and support people who use digital technology in creative ways to make society better.

All of our social investments are informed by research into current thinking and best practice. These investments are, in turn, evaluated to identify good practice. This good practice also feeds into further research on how to advance technology as a tool to mobilise positive social change, which subsequently informs new investments.

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There are many ways in which digital technology can bring about change. To make sure we achieve the greatest impact, our focus is on supporting projects and organisations that are using it in imaginative ways to improve lives of the disadvantaged and vulnerable and to strengthen communities.

It is important to remain open to new ideas that offer a fresh perspective. Our aim is to seek out, galvanise and support innovative, early-stage projects that use digital technology to address big social challenges.

We also invest in a number of programmes that address a specific social group or issue, such as young people, local communities or health and well-being. By clustering our investment in this way we hope to increase our social impact. We regularly review the groups of people and issues we support so please check our website to find out our current focus.

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